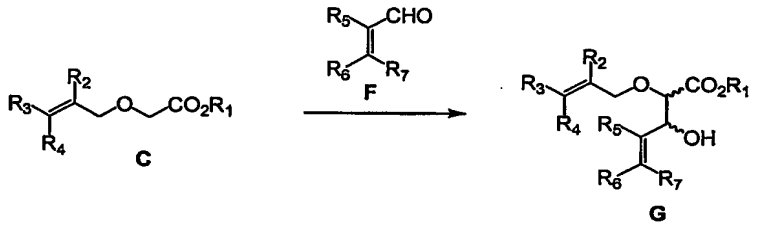
CLAIMS

1. A process for preparing compound of formula **G** comprising contacting compound of formula **C** with compound of formula **F** under conditions to produce compound of formula **G**, where:



a) R_1 is selected from the group consisting of alkyl, substituted alkyl and aryl

b) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

c) $R_3 = R_4 = R_6 = R_7$ = hydrogen, or R_3, R_4, R_6, R_7 are selected such that three out of four are hydrogen and the fourth is selected from the group consisting of alkyl, substituted alkyl and aryl

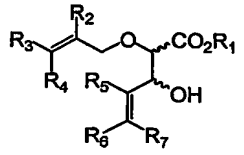
2. A process according to claim 1, where the reaction is carried out in a solvent or in mixtures of solvents selected from the group consisting of diethyl ether, dioxane and tetrahydrofuran.

3. A process according to claim 1, where the reaction is carried out between –100°C and 30°C

4. A process according to claim 1, where compound of formula **C** is contacted with compound of formula **F** in the presence of an organometallic compound selected from the group consisting of lithium diisopropyl amide, tert-butyl lithium, lithium hexamethyldisilazide, sodium hexamethyldisilazide, potassium hexamethyldisilazide, lithium diisopropyl amide-spartein complex and triethyl amine-dicyclohexyl boron triflate complex.

5. A process according to claim 1 where R_1 = ethyl, and R_2 =R_3 = R_4 = R_5 = R_6 = R_7 = hydrogen, or R_1 = ethyl, and R_5 = methyl, and R_2 =R_3 = R_4 = R_6 = R_7 = hydrogen, or R_1 = ethyl, and R_5 = phenyl, and R_2 =R_3 = R_4 = R_6 = R_7 = hydrogen

6. Compounds of formula **G**, where:



G

a) R_1 is selected from the group consisting of alkyl, substituted alkyl and aryl
b) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl
c) R_3 = R_4 = R_6 = R_7 = hydrogen, or R_3, R_4, R_6, R_7 are selected such that three out of four are hydrogen and the fourth is selected from the group consisting of alkyl, substituted alkyl and aryl

7. All stereoisomers of a compound of formula **G**, where R_1 = ethyl and R_2 = R_3 = R_4 = R_5 = R_6 = R_7 = hydrogen, including (2R,3R)-2-Allyloxy-3-hydroxy-pent-4-enoic acid ethyl ester, (2S,3S)-2-Allyloxy-3-hydroxy-pent-4-enoic acid ethyl ester, (2R,3S)-2-Allyloxy-3-hydroxy-pent-4-enoic acid ethyl ester, and (2S,3R)-2-Allyloxy-3-hydroxy-pent-4-enoic acid ethyl ester.

8. A process for preparing compound of formula **H** comprising contacting compound of formula **G** under conditions suitable to produce compound of formula **H**, where:

G **H**

a) R_1 is selected from the group consisting of alkyl, substituted alkyl and aryl
b) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

c) $R_3 = R_4 = R_6 = R_7$ = hydrogen, or R_3, R_4, R_6, R_7 are selected such that three out of four are hydrogen and the fourth is selected from the group consisting of alkyl, substituted alkyl and aryl

d) R_9 is selected from the group consisting of hydrogen, alkyl, substituted alkyl, aryl and hydroxyl protecting group

9. A process according to claim 8 where carboxylic ester of formula **G** is contacted with a ring-closing metathesis catalyst under conditions suitable to produce compound of formula **H**.

10. A process according to claim 8 where carboxylic ester of formula **G** is contacted with a ring-closing metathesis catalyst that contains a metal atom selected from the comprising of ruthenium and molybdenum under conditions suitable to produce compound of formula **H**.

11. A process according to claim 8 where carboxylic ester of formula **G** is contacted with a ring-closing metathesis catalyst selected from the group consisting of 2,6-diisopropylphenylimidoneophylidene molybdenum (IV) bis-(tert-butoxide), 2,6-diisopropylphenylimidoneophylidene molybdenum (IV) bis-(hexafluoro-tert-butoxide), 2,6-diisopropylphenylimidoneophylidene[racemic-BIPHEN] molybdenum (IV), 2,6-diisopropylphenylimidoneophylidene[(R)-(+)-BIPHEN] molybdenum (IV), 2,6-diisopropylphenylimidoneophylidene[(S)-(-)-BIPHEN] molybdenum (IV), bis-(tricyclohexylphosphine)benzylidine ruthenium (IV) dichloride, bis-(tricyclohexylphosphine)-3-methyl-2-butenylidene ruthenium (IV) dichloride, bis-(tricyclopentylphosphine)benzylidine ruthenium (IV) dichloride, bis-(tricyclopentylphosphine)-3-methyl-2-butenylidene ruthenium (IV) dichloride, tricyclohexylphosphine-(1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene)-benzylidine ruthenium (IV) dichloride, tricyclohexylphosphine-(1,3-bis(2,6-diisopropylphenyl)-4,5-dihydroimidazol-2-ylidene)-benzylidine ruthenium (IV) dichloride, (1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene)-2-isopropoxyphenylmethylene ruthenium (IV) dichloride, (tricyclopentylphosphine)-2-isopropoxyphenylmethylene ruthenium (IV) dichloride, and (tricyclopentylphosphine)-2-methoxy-3-naphthylmethylene ruthenium (IV) dichloride under conditions suitable to produce compound of formula **H**.

12. A process according to claim 8 where carboxylic ester of formula **G** is contacted with a ring-closing metathesis catalyst selected from the group consisting of 2,6-diisopropylphenylimidoneophylidene molybdenum (IV) bis-(tert-butoxide), 2,6-diisopropylphenylimidoneophylidene molybdenum (IV) bis-(hexafluoro-tert-butoxide), 2,6-diisopropylphenylimidoneophylidene[racemic-BIPHEN] molybdenum (IV), 2,6-diisopropylphenylimidoneophylidene[(R)-(+)-BIPHEN] molybdenum (IV), and 2,6-diisopropylphenylimidoneophylidene[(S)-(-)-BIPHEN] molybdenum (IV) under conditions suitable to produce compound of formula **H**.

13. A process according to claim 8 where carboxylic ester of formula **G** is contacted with a ring-closing metathesis catalyst selected from the group consisting of bis-(tricyclohexylphosphine)benzylidine ruthenium (IV) dichloride, bis-(tricyclohexylphosphine)-3-methyl-2-butenylidene ruthenium (IV) dichloride, bis-(tricyclopentylphosphine)benzylidine ruthenium (IV) dichloride, bis-(tricyclopentylphosphine)-3-methyl-2-butenylidene ruthenium (IV) dichloride, tricyclohexylphosphine-(1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene)-benzylidine ruthenium (IV) dichloride, tricyclohexylphosphine-(1,3-bis(2,6-diisopropylphenyl)-4,5-dihydroimidazol-2-ylidene)-benzylidine ruthenium (IV) dichloride, (1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene)-2-isopropoxyphenylmethylene ruthenium (IV) dichloride, (tricyclopentylphosphine)-2-isopropoxyphenylmethylene ruthenium (IV) dichloride, and (tricyclopentylphosphine)-2-methoxy-3-naphthylmethylene ruthenium (IV) dichloride under conditions suitable to produce compound of formula **H**.

14. A process according to claim 8 where carboxylic ester of formula **G** is contacted with a ring-closing metathesis catalyst selected from the group consisting of tricyclohexylphosphine-(1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene)-benzylidine ruthenium (IV) dichloride, tricyclohexylphosphine-(1,3-bis(2,6-diisopropylphenyl)-4,5-dihydroimidazol-2-ylidene)-benzylidine ruthenium (IV) dichloride, (1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene)-2-isopropoxyphenylmethylene ruthenium (IV) dichloride, (tricyclopentylphosphine)-2-isopropoxyphenylmethylene ruthenium (IV) dichloride, and (tricyclopentylphosphine)-2-methoxy-3-naphthylmethylene ruthenium (IV) dichloride under conditions suitable to produce compound of formula **H**.

15. A process according to claim 8 where carboxylic ester of formula **G** is contacted with bis(tricyclohexyphosphine)-benzylidine ruthenium (IV) dichloride under conditions suitable to produce compound of formula **H**.

16. A process according to claim 8 where the reaction is carried out in a solvent or in mixtures of solvents selected from the group consisting of acetonitrile, dichloromethane, dichloroethane, diethyl ether, dioxane, tetrahydrofuran, dimethyl formamide, dimethyl acetamide, N-methylpyrrolidine, dimethyl sulfoxide, benzene, toluene, dichlorobenzene, xylene, methanol, ethanol, isopropanol and water.

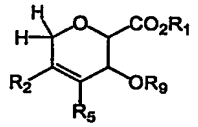
17. A process according to claim 8 where the reaction is carried out between 0°C and 150°C

18. A process according to claim 8 where R_1 = ethyl, and R_2 =R_3 = R_4 = R_5 = R_6 = R_7 = R_9 = hydrogen, or R_1 = ethyl, and R_6 = methyl, and R_2 =R_3 = R_4 = R_5 = R_7 = R_9 = hydrogen, or R_1 = ethyl, and R_6 = phenyl, and R_2 =R_3 = R_4 = R_5 = R_7 = R_9 = hydrogen

19. A process according to claim 8 where the substituted 3,6-dihydro-2H-pyran **H** is formed as a mixture of stereoisomers or as an optically pure isomer.

20. A process according to claim 8 where the stereoisomers of the substituted 3,6-dihydro-2H-pyran **H** are separated by the use of at least one method selected from the group consisting of chromatography, crystallization, re-crystallization and distillation.

21. Compounds of formula **H**, where:



H

a) R_1 is selected from the group consisting of alkyl, substituted alkyl and aryl

b) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

c) R_9 is selected from the group consisting of hydrogen, alkylcarbonyl, substituted alkylcarbonyl, arylcarbonyl and hydroxyl protecting group.

22. All stereoisomers of a compound of formula **H**, where R_1 = ethyl and R_2 = R_5 = R_9 = hydrogen, or R_1 = ethyl and R_2 = R_5 = hydrogen and R_9 = acetyl, including (2R,3R)-3-hydroxy-3,6-dihydro-2H-pyran-2-carboxylic acid ethyl ester, (2S,3S)-3-hydroxy-3,6-dihydro-2H-pyran-2-carboxylic acid ethyl ester, (2S,3R)-3-hydroxy-3,6-dihydro-2H-pyran-2-carboxylic acid ethyl ester, (2R,3S)-3-hydroxy-3,6-dihydro-2H-pyran-2-carboxylic acid ethyl ester, (2R,3R) 3-acetoxy-3,6-dihydro-2H-pyran-2-carboxylic acid ethyl ester, (2S,3S) 3-acetoxy-3,6-dihydro-2H-pyran-2-carboxylic acid ethyl ester, (2R,3S) 3-acetoxy-3,6-dihydro-2H-pyran-2-carboxylic acid ethyl ester, (2S,3R) 3-acetoxy-3,6-dihydro-2H-pyran-2-carboxylic acid ethyl ester.

23. A process for preparing compound of formula **H** comprising contacting compound of formula **I** with a resolving enzyme and an acylating agent under suitable conditions to produce optically pure 3,6-dihydro-2H-pyran of formula **H**, where:

a) R_1 is selected from the group consisting of alkyl, substituted alkyl and aryl

b) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

c) R_9 is selected from the group consisting of hydrogen, alkylcarbonyl, substituted alkylcarbonyl and arylcarbonyl

24. A process according to claim 23 wherein the enzymatic resolution comprises an enzyme-catalyzed transesterification of a compound of formula **I**.

25. A process according to claim 23 wherein the enzymatic resolution involves the use of a lipase, esterase, peptidase, acylase or protease enzyme of mammalian, plant, fungal or bacterial origin.

26. A process according to claim 23 wherein the resolving enzyme is immobilized on solid support.

27. A process according to claim 23 wherein the acylating agent is selected from the group consisting of ethyl acetate, vinyl acetate, vinyl propionate, vinyl butyrate, isopropenyl acetate, 1-ethoxyvinyl acetate, trichloroethyl butyrate, trifluoroethyl butyrate, trifluoroethyl laureate, S-ethyl thiooctanoate, biacetyl monooxime acetate, acetic anhydride, succinic anhydride, amino acid and diketene.

28. A process according to claim 23 wherein the resolving enzyme is selected from the group consisting of Lipase Amano lipase PS-D (immobilized lipase from *Pseudomonas cepacia*), Amano Lipase PS-C (immobilized lipase from *Pseudomonas cepacia*), Roche Chirazyme L-3 (lipase, lyophilizate, from *Candida Rugosa)*, Roche Chirazyme L-3 (purified lipase, lyophilizate, from *Candida Rugosa*), Roche Chirazyme L-3 (purified lipase, carrier-fixed, carrier 2, lyophilizate, from *Candida rugosa*), Roche Chirazyme L-5 (lipase, solution, from *Candida antartica, type A)*, Roche Chirazyme L-5 (lipase, lyophilizate, from *Candida antartica, type A*), Roche Chirazyme L-5 (lipase, carrier-fixed, carrier 1, lyophilizate, from *Candida antartica, type A)*, Roche Chirazyme L-10 (lipase, lyophilizate, from *Alcaligines sp.*), Altus Biologics 8 (lipase from *Mucor meihei*) and Altus Biologics 27 (lipase from *Alcaligenes sp.*).

29. A process according to claim 23 where the reaction is carried out in a solvent or in mixtures of solvents selected from the group consisting of acetonitrile, dichloromethane, dichloroethane, diethyl ether, dioxane, tetrahydrofuran, dimethyl formamide, dimethyl acetamide, N-methylpyrrolidine, dimethyl sulfoxide, benzene, toluene, dichlorobenzene, xylene, methanol, ethanol, isopropanol and water.

30. A process according to claim 23 where the reaction is carried out between 0°C and 40°C

31. A process according to claim 23 where the optically pure 3,6-dihydro-2H-pyran **H** is isolated by the use of at least one method selected from the group consisting of chromatography, crystallization, re-crystallization and distillation.

32. A process according to claim 23 where R_1 is ethyl, R_2 and R_5 are hydrogen and R_9 is selected from the group consisting of hydrogen and acetyl.

33. A process according to claim 23 where the substituted 3,6-dihydro-2H-pyran **H** selected from the group consisting of (2R,3R) 3-acetoxy-3,6-dihydro-2H-pyran-2-carboxylic acid ethyl ester, (2S,3S) 3-hydroxy-3,6-dihydro-2H-pyran-2-carboxylic acid ethyl ester, (2S,3R) 3-acetoxy-3,6-dihydro-2H-pyran-2-carboxylic acid ethyl ester, and (2R,3S) 3-hydroxy-3,6-dihydro-2H-pyran-2-carboxylic acid ethyl ester.

34. A process for preparing compound of formula **J** comprising contacting compound of formula **H** under conditions suitable to produce a substituted tetrahydropyran of formula **J**, where:

H **J**

a) R_1 is selected from the group consisting of alkyl, substituted alkyl and aryl
b) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl
c) R_9 is selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group.

35. A process according to claim 34 where the compound of formula **H** is contacted with any suitable mixtures of compounds selected from the group consisting of osmium tetroxide, potassium permanganate, thallium acetate, potassium periodate, silver acetate, N-methylmorpholine oxide, trimethylamine oxide, tert-butyl peroxide, iodine, potassium ferricyanide, pyridine, quinuclidine, dihydroquinine acetate, dihydroquinidine acetate, dihydroquinine anthraquinone-

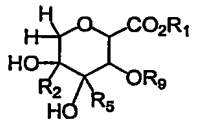
1,4-diyl diether ($(DHQ)_2AQN$), dihydroquinine phthalazine-1,4-diyl diether ($(DHQ)_2PHAL$), dihydroquinine 2,5-diphenyl-4,6-pyrimidinediyl diether ($(DHQ)_2PYR$), dihydroquinidine anthraquinone-1,4-diyl diether ($(DHQD)_2AQN$), dihydroquinidine phthalazine-1,4-diyl diether ($(DHQD)_2PHAL$), dihydroquinidine 2,5-diphenyl-4,6-pyrimidinediyl diether ($(DHQD)_2PYR$), tetraethyl ammonium hydroxide, tetraethyl ammonium acetate, and N,N,N'N'-tetramethylethylene diamine under conditions suitable to produce compound of formula **J**.

36. A process according to claim 34 where the reaction is carried out in a solvent or in mixtures of solvents selected from the group consisting of dichloromethane, water, 2-methyl-2-propanol and tetrahydrofuran.

37. A process according to claim 34 where the reaction is carried out between -78°C and 60°C

38. A process according to claim 34 where R_1 = ethyl, and $R_2 = R_5$ = hydrogen and R_9 = acetyl, or R_1 = ethyl, and $R_2 = R_5 = R_9$ = hydrogen.

39. Compounds of formula **J**, where:



J

a) R_1 is selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

b) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

c) R_9 is selected from the group consisting of hydrogen, alkyl, substituted alkyl, substituted alkylcarbonyl, alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group.

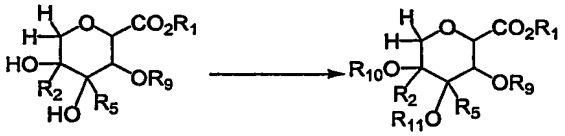
With the proviso that:

1. Stereoisomers (2R,3R,4S,5S), (2R,3S,4S,5R), (2R,3R,4R,5R), (2R,3R,4S,5R), (2S,3R,4R,5R) cannot have R_1 = hydrogen or methyl and $R_2 = R_5 = R_9$ = hydrogen

2. Stereoisomer (2S,3S,4R,5R) cannot have R_1 = hydrogen or methyl and R_2 = R_5 = R_9 = hydrogen;

40. Compounds of formula **J** selected from the group consisting of (1R,2R,3R,4R) 3-acetoxy-4,5-dihydroxy-tetrahydropyran-2-carboxylic acid ethyl ester, (1R,2R,3S,4S) 3-acetoxy-4,5-dihydroxy-tetrahydropyran-2-carboxylic acid ethyl ester, (1S,2S,3R,4R) 3-acetoxy-4,5-dihydroxy-tetrahydropyran-2-carboxylic acid ethyl ester, (1S,2S,3S,4S) 3-acetoxy-4,5-dihydroxy-tetrahydropyran-2-carboxylic acid ethyl ester, (1R,2S,3R,4R) 3-acetoxy-4,5-dihydroxy-tetrahydropyran-2-carboxylic acid ethyl ester, (1R,2S,3S,4S) 3-acetoxy-4,5-dihydroxy-tetrahydropyran-2-carboxylic acid ethyl ester, (1S,2R,3R,4R) 3-acetoxy-4,5-dihydroxy-tetrahydropyran-2-carboxylic acid ethyl ester, (1S,2R,3S,4S) 3-acetoxy-4,5-dihydroxy-tetrahydropyran-2-carboxylic acid ethyl ester, (1R,2R,3R,4R) 3-4,5-trihydroxy-tetrahydropyran-2-carboxylic acid ethyl ester, (1R,2R,3S,4S) 3-4,5-trihydroxy-tetrahydropyran-2-carboxylic acid ethyl ester, (1S,2S,3R,4R) 3-4,5-trihydroxy-tetrahydropyran-2-carboxylic acid ethyl ester, (1S,2S,3S,4S) 3-4,5-trihydroxy-tetrahydropyran-2-carboxylic acid ethyl ester, (1R,2S,3R,4R) 3-4,5-trihydroxy-tetrahydropyran-2-carboxylic acid ethyl ester, (1R,2S,3S,4S) 3-4,5-trihydroxy-tetrahydropyran-2-carboxylic acid ethyl ester, (1S,2R,3R,4R) 3-4,5-trihydroxy-tetrahydropyran-2-carboxylic acid ethyl ester, and (1S,2R,3S,4S) 3-4,5-trihydroxy-tetrahydropyran-2-carboxylic acid ethyl ester.

41. A process for preparing compound of formula **K** comprising contacting compound of formula **J** under conditions suitable to produce a substituted tetrahydropyran of formula **K**, where:



J **K**

a) R_1 is selected from the group consisting of alkyl, substituted alkyl and aryl

b) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

c) R_9, R_{10} and R_{11} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group.

42. A process according to claim 41 comprising contacting compound of formula **J** with a resolving enzyme and an acylating agent under conditions suitable to produce optically pure tetrahydropyran of formula **K**.

43. A process according to claim 41 wherein the reaction comprises an enzyme catalyzed transesterification of compound of formula **J**.

44. A process according to claim 41 wherein compound of formula **J** is contacted with a lipase, esterase, peptidase, acylase or protease enzyme of mammalian, plant, fungal or bacterial origin.

45. A process according to claim 41 wherein compound of formula **J** is contacted with a resolving enzyme that is immobilized on solid support.

46. A process according to claim 41 wherein compound of formula **J** is contacted with a resolving enzyme selected from the group consisting of Lipase Amano lipase PS-D (immobilized lipase from *Pseudomonas cepacia*), Amano Lipase PS-C (immobilized lipase from *Pseudomonas cepacia*), Roche Chirazyme L-3 (lipase, lyophilizate, from *Candida Rugosa)*, Roche Chirazyme L-3 (purified lipase, lyophilizate, from *Candida Rugosa*), Roche Chirazyme L-3 (purified lipase, carrier-fixed, carrier 2, lyophilizate, from *Candida rugosa*), Roche Chirazyme L-5 (lipase, solution, from *Candida antartica, type A)*, Roche Chirazyme L-5 (lipase, lyophilizate, from *Candida antartica, type A*), Roche Chirazyme L-5 (lipase, carrier-fixed, carrier 1, lyophilizate, from *Candida antartica, type A)*, Roche Chirazyme L-10 (lipase, lyophilizate, from *Alcaligines sp.*), Altus Biologics 8 (lipase from *Mucor miehei*) and Altus Biologics 27 (lipase from *Alcaligenes sp.*).

47. A process according to claim 41 wherein compound of formula **J** is contacted with a resolving enzyme and an acylating agent selected from the group consisting of ethyl acetate, vinyl acetate, vinyl propionate, vinyl butyrate, isopropenyl acetate, 1-ethoxyvinyl acetate, trichloroethyl butyrate, trifluoroethyl butyrate, trifluoroethyl

laureate, S-ethyl thiooctanoate, biacetyl monooxime acetate, acetic anhydride, succinic anhydride, amino acid and diketene.

48. A process according to claim 41 where compound of formula J is contacted with a compound selected from the group consisting of diazomethane, trimethylsilyldiazomethane, alkyl halide, alkyl triflate, alkyl sulfonate, alkylcarbonyl halide, alkylcarbonyl anhydride, arylcarbonyl halide, arylcarbonyl anhydride, alkyl isocyanate, aryl isocyanate, alkyloxycarbonyl halide, aryloxycarbonyl halide, alkylsulfonyl halide, arylsulfonyl halide, trialkylsilyl halide, dialkylarylsilyl halide, alkyldiarylsilyl halide, triarylsilyl halide, dialkyloxyphosphoryl halide and α,β-unsaturated carbonyl.

49. A process according to claim 41 where compound of formula J is contacted with an alkylhydroxy in the presence of a trialkylphosphine or triarylphosphine and a dialkyl azodicarboxylate.

50. A process according to claim 41 where compound of formula J is contacted with a compound selected from the group consisting of alkylcarboxy, substituted alkylcarboxy, arylcarboxy, substituted arylcarboxy, and amino acid and a compound selected from the group consisting of dicyclohexylcarbodiimide, diisopropyl carbodiiimide, 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide, N-hydroxybenzotriazole, N-hydroxysuccinimide, 4-nitrophenol, pentafluorophenol, 2-(1H-benzotriazole-1-yl)-1,1,3,3-tetramethyluronium tetrafluoroborate, O-benzotriazole-N,N,N'N'-tetramethyluronium hexafluorophosphate, benzotriazole-1-yl-oxy-tris-(dimethylamino)-phosphonium hexafluorophosphate, benzotriazole-1-yl-oxy-tris-pyrrolidinophosphonium hexafluorophosphate, bromo-trispyrrolidino-phosphonium hexafluorophosphate, 2-(5-norbornene-2,3-dicarboximido)-1,1,3,3-tetramethyluronium tetrafluoroborate, O-(N-succinimidyl)-1,1,3,3-tetramethyluronium tetrafluoroborate, and tetramethylfluoroformamidinium hexafluorophosphate.

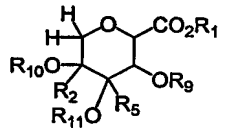
51. A process according to claim 41 where the reaction is carried out in a solvent or in mixtures of solvents selected from the group consisting of acetonitrile, dichloromethane, dichloroethane, diethyl ether, dioxane, tetrahydrofuran, dimethyl formamide, dimethyl acetamide, N-methylpyrrolidine, dimethyl sulfoxide,

benzene, toluene, dichlorobenzene, xylene, methanol, ethanol, isopropanol and water.

52. A process according to claim 41 where the reaction is carried out between -100°C and 150°C

53. A process according to claim 41 where the optically pure compound of formula **K** is isolated by the use of at least one method selected from the group consisting of chromatography, crystallization, re-crystallization and distillation.

54. Compounds of formula **K**, where:



K

a) R_1 is selected from the group consisting of alkyl, substituted alkyl and aryl

b) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

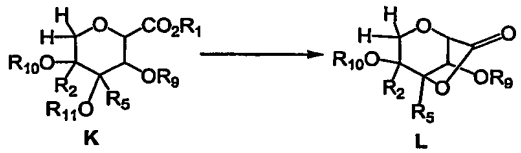
c) R_9, R_{10} and R_{11} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group.

With the proviso that

1. Stereoisomers (2R, 3R, 4S, 5S), (2R, 3S, 4S, 5R), (2R, 3R, 4R, 5R), (2R, 3R, 4S, 5R), (2S, 3R, 4R, 5R), (2S, 3S, 4R, 5S), (2R, 3S, 4R, 5S) cannot have R_1 = methyl and $R_2 = R_5$ = hydrogen and $R_9 = R_{10} = R_{11}$ = acetyl;
2. Stereoisomers (2R, 3R, 4S, 5S), (2R, 3S, 4S, 5R), (2R, 3R, 4R, 5R), (2R, 3R, 4S, 5R), (2S, 3R, 4R, 5R), (2S, 3S, 4R, 5R) cannot have R_1 = methyl and $R_2 = R_5 = R_9 = R_{10} = R_{11}$ = hydrogen.
3. Stereoisomers (2R, 3R, 4S, 5S), (2R, 3S, 4S, 5R), (2R, 3R, 4R, 5R), (2R, 3R, 4S, 5R), (2S, 3R, 4R, 5R), (2S, 3S, 4R, 5R) cannot have $R_1 = R_2 = R_5 = R_9 = R_{10} = R_{11}$ = hydrogen;

2. Stereoisomers (2S, 3S, 4R, 5R), (2R, 3S, 4R, 5R) cannot have $R_1 = R_{10} = R_{11}$ = methyl and $R_2 = R_5$ = hydrogen and R_9 = acetyl
3. Stereoisomers (2S, 3S, 4R, 5R), (2R, 3S, 4R, 5R) cannot have $R_1 = R_{10} = R_{11}$ = methyl and $R_2 = R_5$ = hydrogen and R_9 = benzoyl
4. Stereoisomer (2S, 3R, 4R, 5S) cannot have $R_1 = R_2 = R_5$ = hydrogen and $R_9 = R_{10} = R_{11}$ = acetyl
5. Stereoisomer (1S, 4R, 5R, 8S) cannot have R_1 = methyl $R_2 = R_5 = R_{11}$ = hydrogen and $R_9 = R_{10}$ = benzyl.

55. A process for preparing compound of formula **L** comprising contacting compound of formula **K** under conditions suitable to produce a substituted bicyclo [3.2.1] lactone of formula **L**, where:



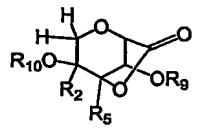
a) R_1 is selected from the group consisting of alkyl, substituted alkyl and aryl
b) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl
c) R_9 and R_{10} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group.
d) R_{11} = hydrogen

56. A process according to claim 55 where the reaction is carried out under microwave irradiation.

57. A process according to claim 56 where the reaction is carried out in a solvent or in mixtures of solvents selected from the group consisting of acetonitrile, dichloromethane, dichloroethane, diethyl ether, dioxane, tetrahydrofuran, dimethyl formamide, dimethyl acetamide, N-methylpyrrolidine, dimethyl sulfoxide, benzene, toluene, dichlorobenzene, xylene, methanol, ethanol, isopropanol and water

58. A process according to claim 56, where the reaction is carried out between 0°C and 200°C

59. Compounds of formula **L**, where:



L

a) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

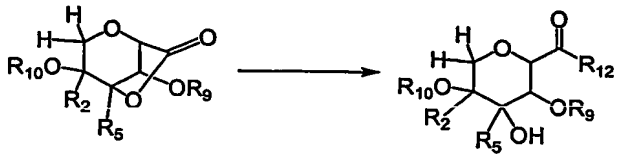
b) R_9 and R_{10} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group.

With the proviso that:

1. Stereoisomer (1S, 4R, 5R, 8S) cannot have $R_2 = R_5 = R_9 = R_{10}$ = hydrogen,
2. Stereoisomer (1S, 4R, 5R, 8S) cannot have $R_2 = R_5 = R_{10}$ = hydrogen and R_9 = benzoyl
3. Stereoisomer (1S, 4R, 5R, 8S) cannot have $R_2 = R_5$ = hydrogen and $R_9 = R_{10}$ = benzoyl
4. Stereoisomer (1S, 4R, 5R, 8S) cannot have $R_2 = R_5$ = hydrogen and $R_9 = R_{10}$ = benzyl

60. Compound of formula **L** selected from the group (1R,4S,5S,8R)-8-acetoxy-4-hydroxy-2,6-dioxa-bicyclo[3.2.1]octan-7-one), and (1R,4S,5S,8R)-4,8-hydroxy-2,6-dioxa-bicyclo[3.2.1]octan-7-one.

61. A process for preparing compound of formula **M** comprising contacting compound of formula **L** with a nucleophile under conditions suitable to produce a substituted tetrahydropyran of formula **M**, where:



L M

a) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

b) R_9 and R_{10} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group.

c) R_{12} = alkyl, substituted alkyl, aryl, hydroxy, alkyloxy, substituted alkyloxy, aryloxy, amino, alkylamino, arylamino, hydrazino, alkylhydrazino, arylhydrazino, alkylcarbonylhydrazino, arylcarbonylhydrazino, nitrogen containing saturated heterocyclic compound, O-protected amino acid and solid support.

With the proviso Compounds of formula **L** cannot be the stereoisomer (1S,4R,5R,8S) where $R_2 = R_5$ = hydrogen and $R_9 = R_{10}$ = benzyl and R_{12} = methoxy

62. A process according to claim 61 where compound of formula **L** is contacted with a Lewis acid and a nucleophile under conditions suitable to produce a substituted tetrahydropyran of formula **M**, more specifically where the Lewis acid is selected from the group consisting of boron trifluoride, boron trifluoride etherate, boron trifluoride tetrahydrofuran complex, boron trifluoride tert-butyl-methyl ether complex, boron trifluoride dibutyl ether complex, boron trifluoride dihydrate, boron trifluoride di-acetic acid complex, boron trifluoride dimethyl sulfide complex, boron trichloride, boron trichloride dimethyl sulfide complex, boron tribromide, boron tribromide dimethyl sulfide complex, boron triiodide, trimethoxyborane, triethoxyborane, trimethylaluminum, triethylaluminum, aluminum trichloride, aluminum trichloride tetrahydrofuran complex, aluminum tribromide, titanium tetrachloride, titanium tetrabromide, titanium iodide, titanium tetraethoxide, titanium tetraisopropoxide, scandium (III) trifluoromethanesulfonate, yttrium (III) trifluoromethanesulfonate, ytterbium (III) trifluoromethanesulfonate, lanthanum (III) trifluoromethanesulfonate, zinc

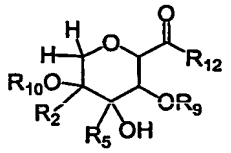
(II) chloride, zinc (II) bromide, zinc (II) iodide, zinc (II) trifluoromethanesulfonate, zinc (II) sulfate, magnesium sulfate, lithium perchlorate, copper (II) trifluoromethanesulfonate, and copper (ii) tetrafluoroborate, and where the nucleophile is selected from the group comprising water, hydroxide, alkylhydroxy, substituted alkylhydroxy, arylhydroxy, alkyloxide, substituted alkyloxide, aryloxide, ammonia, an ionic salt of ammonia, alkylamine, dialkylamine, substituted alkylamine, substituted dialkylamine, arylamine, diarylamine, alkylamine anion, dialkylamine anion, substituted alkylamine anion, substituted dialkylamine anion, arylamine anion, diarylamine anion, hydrazino, alkylhydrazino, arylhydrazino, alkylcarbonylhydrazino, arylcarbonylhydrazino, hydrazine anion, alkylhydrazine anion, arylhydrazine anion, alkylcarbonylhydrazine anion, arylcarbonylhydrazine anion, a nitrogen containing saturated heterocycle, an anion of a nitrogen containing saturated heterocycle an O-protected amino acid, an anion of an O-protected amino acid, alkyl anion, substituted alkyl anion, aryl anion, a solid support, and an anion of a solid support.

63. A process according to claim 61 where the nucleophile is derived from an organometallic reagent where the metal is selected from the group consisting of lithium, magnesium, aluminum, boron, cobalt, copper, iron, mercury, nickel, palladium, platinum, rhodium, titanium, zinc and zirconium.

64. A process according to claim 61 where the reaction is carried out in a solvent or in mixtures of solvents selected from the group consisting of acetonitrile, dichloromethane, dichloroethane, diethyl ether, dioxane, tetrahydrofuran, dimethyl formamide, dimethyl acetamide, N-methylpyrrolidine, dimethyl sulfoxide, benzene, toluene, dichlorobenzene, xylene, methanol, ethanol, isopropanol and water.

65. A process according to claim 61 where the reaction is carried out between –100°C and 150°C.

66. A compound of formula **M**, where



M

a) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

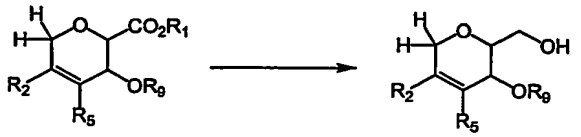
b) R_9 and R_{10} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group.

c) R_{12} = alkyl, substituted alkyl, aryl, hydroxy, alkyloxy, substituted alkyloxy, aryloxy, amino, alkylamino, arylamino, nitrogen containing saturated heterocyclic compound, O-protected amino acid and solid support.

With the proviso that:

1. Stereoisomers (2R, 3R, 4S, 5S), (2R, 3S, 4S, 5R), (2R, 3R, 4R, 5R), (2R, 3R, 4S, 5R), (2S, 3R, 4R, 5R), (2S, 3S, 4R, 5R) cannot have R_{12} = hydroxy and $R_2 = R_5 = R_9 = R_{10}$ = hydrogen,
2. Stereoisomers (2R, 3R, 4S, 5S), (2R, 3S, 4S, 5R), (2R, 3R, 4R, 5R), (2R, 3R, 4S, 5R), (2S, 3R, 4R, 5R), (2S, 3S, 4R, 5R) cannot have R_{12} = methoxy and $R_2 = R_5 = R_9 = R_{10}$ = hydrogen,
3. Stereoisomers (2R, 3R, 4S, 5S), (2R, 3S, 4S, 5R), (2R, 3R, 4R, 5R), (2R, 3R, 4S, 5R), (2S, 3R, 4R, 5R), (2S, 3S, 4R, 5S) cannot have R_{12} = amino and $R_2 = R_5 = R_9 = R_{10}$ = hydrogen,
4. Stereoisomer (1S, 4R, 5R, 8S) cannot have $R_2 = R_5$ = hydrogen and $R_9 = R_{10}$ = benzyl and R_{12} = methoxy

67. A process for preparing compound of formula **N** comprising contacting compound of formula **H** under conditions suitable to produce a substituted 3,6-dihydro-2H-pyran of formula **N**, where:



H N

a) R_1 is selected from the group consisting of alkyl, substituted alkyl and aryl

b) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

c) R_9 is selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group

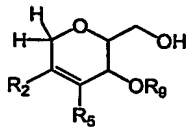
68. A process according to claim 67, where compound of formula **H** is contacted with a compound selected from the group consisting of borane-dimethyl sulfide complex, 9-borabicyclo[3.3.1.]nonane (9-BBN), catechol borane, lithium borohydride, sodium borohydride, sodium borohydride-methanol complex, potassium borohydride, sodium hydroxyborohydride, lithium triethylborohydride, lithium n-butylborohydride, sodium cyanoborohydride, calcium (II) borohydride, lithium aluminum hydride, diisobutylaluminum hydride, n-butyl-diisobutylaluminum hydride, sodium bis-methoxyethoxyaluminum hydride, triethoxysilane, diethoxymethylsilane, lithium hydride, lithium, sodium, and hydrogen Ni/B, under conditions suitable to produce a substituted 3,6-dihydro-2H-pyran of formula **N.**

69. A process according to claim 67 where the reaction is carried out in a solvent or in mixtures of solvents selected from the group consisting of water, ammonia, methanol, ethanol, isopropanol, diethyl ether, dioxane and tetrahydrofuran.

70. A process according to claim 67 where the reaction is carried out between -100°C and 100°C

71. A process according to claim 67 where R_1 = ethyl, and R_2 = R_5 = R_9 = hydrogen, or R_1 = ethyl, and R_2 =R_5 = hydrogen and R_9 = acetyl.

72. A compound of formula **N**, where:



N

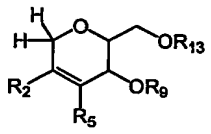
a) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

b) R_9 is selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group

With the proviso that for compounds of formula **N**, stereoisomers (2R,3S), (2S,3R) and (2R,3R) cannot have $R_2 = R_5 = R_9$ = hydrogen.

73. The (2S,3S) stereoisomer of formula **N**, where $R_2 = R_5 = R_9$ = hydrogen ((2S,3S)-2-Hydroxymethyl-3,6-dihydro-2H-pyran-3-ol).

74. Compounds of formula **O**, where:



O

a) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

b) R_9 is selected from the group consisting of alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group

c) R_{13} is selected from the group consisting of hydrogen, alkyl, substituted alkyl, aryl, alkylcarbonyl, arylcarbonyl, and hydroxyl protecting group

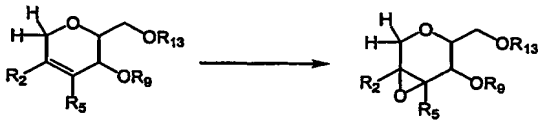
With the proviso that for Compounds of formula **O**,

1) Stereoisomers (2R,3S), (2S,3R) and (2R,3R) cannot have $R_9 = R_{13}$ = acetyl

2) Stereoisomer (2R,3S) cannot have R_9 = 2-bromoallyl and R_{13} = tert-butyldimethylsilyl

3) Stereoisomer (2R,3S) cannot have R_9 = 2-bromobenzyl and R_{13} = tert-butyldimethylsilyl
4) Stereoisomer (2R,3S) cannot have R_9 = 2-bromocyclopent-1-ene and R_{13} = tert-butyldimethylsilyl
5) Stereoisomer (2R,3S) cannot have R_9 = 2-bromocyclohex-1-ene and R_{13} = tert-butyldimethylsilyl
6) Stereoisomer (2R,3S) cannot have R_9 = trichloromethylimidate [$C(=NH)CCl_3$] and R_{13} = acetyl
7) Stereoisomer (2R,3S) cannot have R_9 = trichloromethylimidate [$C(=NH)CCl_3$] and R_{13} = tert-butyldimethylsilyl
8) Stereoisomer (2R,3S) cannot have R_9 = 4-methoxyphenylaminocarboxy [4-$CH_3OC_6H_4NHC(=O)$] and R_{13} = benzoyl
9) Stereoisomer (2R,3S) cannot have R_9 = 4-methoxyphenylaminocarboxy [4-$CH_3OC_6H_4NHC(=O)$] and R_{13} = tert-butyldimethylsilyl
10) Stereoisomer (2S,3R) cannot have R_9 = allyl and R_{13} = tosyl
11) Stereoisomer (2R,3R) cannot have R_9 = R_{13} = benzoyl
12) Stereoisomer (2R,3R) cannot have R_9 = 2-bromoallyl and R_{13} = tert-butyldimethylsilyl

75. A process for preparing compound of formula **P** comprising contacting compound of formula **O** under conditions suitable to produce a substituted 3,7-dioxabicyclo[4.1.0]heptane of formula **P**, where:



O **P**

a) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl
b) R_9 and R_{13} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group.

With the proviso that for Compounds of formula **P**:

1. Stereoisomer (1S,4R,5R,6R) cannot have R_9 = hydrogen and R_{13} = tert-butyldimethylsilyl

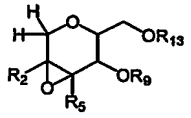
2. Stereoisomer (1S,4R,5R,6R) cannot have R_9 = hydrogen and R_{13} = tert-butyldiphenylsilyl

76. A process according to claim 75 where compound of formula **O** is contacted with any suitable mixtures of compounds selected from the group consisting of oxygen, tert-butyl hydroperoxide, meta-chloroperbenzoic acid, dimethyl dioxirane, oxone, acetone, sodium hypochlorite, sodium periodate, iodosylbenzene, titanium tetraisopropoxide, polymer supported cyclopentadienyl titanium trichloride, zirconium tetraethoxide, hafnium tetraisopropoxide, vanadium pentoxide, niobium pentaethoxide, tantalum pentaisopropoxide, manganese (II) trifluoromethanesulfonate, iron (III) acetylacetonate, molybdenum hexacarbonyl, ruthenium dichloride tris(triphenylphosphine), cobalt (II) trifluoromethanesulfonate, (R,R) diethyl tartarate, (S,S) diethyl tartarate, N-ethyl ephedrine, N-methylprolinol, porphyrin, 2,2'-[[(1S,2S)-1,2-diphenyl-1,2-ethanediyl]-bis(nitrilomethylidyne)]bis[6-(1,1-dimethylethyl)-4-methyl-phenol, 2,2'-[[(1R,2R)-1,2-diphenyl-1,2-ethanediyl]-bis(nitrilomethylidyne)]bis[6-(1,1-dimethylethyl)-4-methyl-phenol, and 2,2'-[(1R,2R)-1,2-cyclohexanediylbis[(E)-nitrilomethylidyne]]bis[6-(1,1-dimethylethyl)-4-methyl-phenol under conditions suitable to produce compound of formula **P**.

77. A process according to claim 75 where the reaction is carried out in a solvent or in mixtures of solvents selected from the group consisting of acetonitrile, dichloromethane, dichloroethane, diethyl ether, dioxane, tetrahydrofuran, dimethyl formamide, dimethyl acetamide, N-methylpyrrolidine, dimethyl sulfoxide, benzene, toluene, dichlorobenzene, xylene, methanol, ethanol, isopropanol and water.

78. A process according to claim 75 where the reaction is carried out between 100°C and 100°C

79. Compounds of formula **P**, where:



P

a) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

b) R_9 and R_{13} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group.

With the proviso that:

1. Stereoisomer (1S,4R,5R,6R) cannot have R_9 = hydrogen and R_{13} = tert-butyldimethylsilyl
2. Stereoisomer (1S,4R,5R,6R) cannot have R_9 = hydrogen and R_{13} = tert-butyldiphenylsilyl

80. Stereoisomers (1R,4S,5S,6S), (1S,4S,5S,6R), (1R,4R,5R,6S), (1R,4S,5R,6S), (1S,4R,5S,6R), (1S,4S,5R,6R), (1R,4R,5S,6S) of compounds of formula **P**, where R_2 = R_5 = R_9 = hydrogen and R_{13} = tert-butyldimethylsilyl

81. A process for preparing compound of formula **Q** comprising contacting compound of formula **P** with a nucleophile under conditions suitable to produce a substituted tetrahydropyran of formula **Q**, where:

P **Q**

a) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

b) R_9 is selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group.

c) R_{13} is selected from the group consisting of alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group.

d) R_{14} is selected from the group consisting of hydrogen, halogen, alkyl, substituted alkyl, aryl, heteroaryl, saturated heteroaryl, cyano, azido, amino, alkylamino, arylamino, hydrazino, alkylhydrazino, arylhydrazino, alkylcarbonylhydrazino, arylcarbonylhydrazino, hydroxy, alkoxy, aryloxy,

alkylthio, arylthio, alkylcarboxy, arylcarboxy, N-protected amino acid, O-protected amino acid and a solid support.

e) R_{15} =hydrogen.

82. A process according to claim 81 where the reaction is carried out in a solvent or in mixtures of solvents selected from the group consisting of acetonitrile, dichloromethane, dichloroethane, diethyl ether, dioxane, tetrahydrofuran, dimethyl formamide, dimethyl acetamide, N-methylpyrrolidine, dimethyl sulfoxide, benzene, toluene, dichlorobenzene, xylene, methanol, ethanol, isopropanol and water.

83. A process according to claim 81 where the reaction is carried out between 100°C and 150°C.

84. A process according to claim 81 where compound of formula **P** is contacted with a nucleophile and a Lewis acid under conditions suitable to produce compound of formula **Q**, more specifically where the Lewis acid is selected from the group consisting of boron trifluoride, boron trifluoride etherate, boron trifluoride tetrahydrofuran complex, boron trifluoride tert-butyl-methyl ether complex, boron trifluoride dibutyl ether complex, boron trifluoride dihydrate, boron trifluoride di-acetic acid complex, boron trifluoride dimethyl sulfide complex, boron trichloride, boron trichloride dimethyl sulfide complex, boron tribromide, boron tribromide dimethyl sulfide complex, boron triiodide, trimethoxyborane, triethoxyborane, trimethylaluminum, triethylaluminum, aluminum trichloride, aluminum trichloride tetrahydrofuran complex, aluminum tribromide, titanium tetrachloride, titanium tetrabromide, titanium iodide, titanium tetraethoxide, titanium tetraisopropoxide, scandium (III) trifluoromethanesulfonate, yttrium (III) trifluoromethanesulfonate, ytterbium (III) trifluoromethanesulfonate, lanthanum (III) trifluoromethane-sulfonate, zinc (II) chloride, zinc (II) bromide, zinc (II) iodide, zinc (II) trifluoromethanesulfonate, zinc (II) sulfate, magnesium sulfate, lithium perchlorate, copper (II) trifluoromethanesulfonate, and copper (II) tetrafluoroborate, and where the nucleophile is selected from the group consisting of hydride, halide, cyanide, azide, water, hydroxide, alkylhydroxy, substituted alkylhydroxy, arylhydroxy, alkyloxide, substituted alkyloxide, aryloxide, ammonia, an ionic salt of ammonia, alkylamine, dialkylamine, substituted alkylamine,

substituted dialkylamine, arylamine, diarylamine, alkylamine anion, dialkylamine anion, substituted alkylamine anion, substituted dialkylamine anion, arylamine anion, diarylamine anion, hydrazine, alkylhydrazine, arylhydrazine, alkylcarbonylhydrazine, arylcarbonylhydrazine, hydrazine anion, alkylhydrazine anion, arylhydrazine anion, alkylcarbonyl-hydrazine anion, arylcarbonylhydrazine anion, a nitrogen containing saturated heterocycle, a nitrogen containing saturated heterocycle anion, a nitrogen containing heteroaryl, a nitrogen containing heteroaryl anion, phthalimide, substituted phthalimide, maleimide, substituted maleimide, phathalimide anion, substituted phathlimide anion, maleimide anion, substituted maleimide anion, O-protected amino acid, O-protected amino acid anion, N-protected amino acid, N-protected amino acid anion, alkyl anion, substituted alkyl anion, aryl anion, a solid support, anion of a solid support, compound of formula **N**, and an anion of compound of formula **N**

85. A process according to claim 81 where the nucleophile is derived from an organometallic reagent where the metal is selected from the group consisting of lithium, magnesium, aluminum, boron, cobalt, copper, iron, mercury, nickel, palladium, platinum, rhodium, titanium, zinc and zirconium.

86. A process for preparing compound of formula **Q** comprising contacting compound of formula **P** with a trialkylsilyl cyanide under conditions suitable to produce a substituted tetrahydropyran of formula **Q**, where:

P **Q**

a) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

b) R_9 is selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group.

c) R_{13} is selected from the group consisting of alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group.

d) R_{14} is cyano.

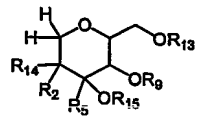
e) R_{15} is selected from the group consisting of hydrogen, trimethylsilyl and tert-butyldimethylsilyl.

87. A process according to claim 86 where the reaction is carried out in a solvent or in mixtures of solvents selected from the group consisting of acetonitrile, dichloromethane, dichloroethane, diethyl ether, dioxane, tetrahydrofuran, dimethyl formamide, dimethyl acetamide, N-methylpyrrolidine, dimethyl sulfoxide, benzene, toluene, dichlorobenzene, xylene, methanol, ethanol, isopropanol and water.

88. A process according to claim 86 where the reaction is carried out between -100°C and 150°C.

89. A process according to claim 86 where compound of formula **P** is contacted with a Lewis acid and a trialkylsilyl cyanide under conditions suitable to produce compound of formula **Q**, more specifically where the Lewis acid is selected from the group consisting of boron trifluoride, boron trifluoride etherate, boron trifluoride tetrahydrofuran complex, boron trifluoride tert-butyl-methyl ether complex, boron trifluoride dibutyl ether complex, boron trifluoride dihydrate, boron trifluoride di-acetic acid complex, boron trifluoride dimethyl sulfide complex, boron trichloride, boron trichloride dimethyl sulfide complex, boron tribromide, boron tribromide dimethyl sulfide complex, boron triiodide, trimethoxyborane, triethoxyborane, trimethylaluminum, triethylaluminum, aluminum trichloride, aluminum trichloride tetrahydrofuran complex, aluminum tribromide, titanium tetrachloride, titanium tetrabromide, titanium iodide, titanium tetraethoxide, titanium tetraisopropoxide, scandium (III) trifluoromethanesulfonate, yttrium (III) trifluoromethanesulfonate, ytterbium (III) trifluoromethanesulfonate, lanthanum (III) trifluoromethane-sulfonate, zinc (II) chloride, zinc (II) bromide, zinc (II) iodide, zinc (II) trifluoromethanesulfonate, zinc (II) sulfate, magnesium sulfate, lithium perchlorate, copper (II) trifluoromethanesulfonate, and copper (II) tetrafluoroborate, and where the trialkylsilyl cyanide is selected from the group consisting of trimethylsilyl cyanide, and tert-butyldimethylsilyl cyanide.

90. Compounds of formula **Q**, where:



Q

a) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

b) R_9 is selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group.

c) R_{13} = -C(O)OR^8, where R^8 is selected from the group consisting of alkyl, substituted alkyl and aryl and more specifically R_8 is selected from the group consisting of methyl, methoxymethyl, 9-fluorenylmethyl, ethyl, 2,2,2-trichloromethyl, 1,1-dimethyl-2,2,2-trichloroethyl, 2-(trimethylsilyl)ethyl, 2-(phenylsulfonyl)ethyl, isobutyl, tert-Butyl, vinyl, allyl, 4-nitrophenyl, benzyl, 2-nitrobenzyl, 4-nitrobenzyl, 4-methoxybenzyl, 2,4-dimethoxybenzyl, 3,4-dimethoxybenzyl, 2-(methylthiomethoxy)ethyl, 2-dansenylethyl, 2-(4-nitrophenyl)ethyl, 2-(2,4-dinitrophenyl)ethyl, 2-cyano-1-phenylethyl, thiobenzyl and 4-ethoxy-1-naphthyl.

d) R_{14} is selected from the group consisting of hydrogen, halogen, alkyl, substituted alkyl, aryl, heteroaryl, saturated heteroaryl, cyano, azido, amino, alkylamino, arylamino, hydroxy, alkoxy, aryloxy, alkylthio, arylthio, alkylcarboxy, arylcarboxy, N-protected amino acid, O-protected amino acid and a solid support.

e) R_{15} =hydrogen.

91. Compounds according to claim 90, where R_{13} = -Si$(R^8)_3$, where R^8 is selected from the group consisting of alkyl, substituted alkyl and aryl and more specifically R_{13} is selected from the group consisting of trimethylsilyl, triethylsilyl, triisopropylsilyl, dimethylisopropylsilyl, diethylisopropylsilyl, dimethylhexylsilyl, tert-butyldimethylsilyl, tert-butyldiphenylsilyl, tribenzylsilyl, tri-p-xylylsilyl, triphenylsilyl, diphenylmethylsilyl, di-tert-butylmethylsilyl, tris(trimethylsilyl)silyl, (2-hydroxystyryl)dimethylsilyl, (2-hydroxystyryl)diisopropylsilyl, tert-butylmethoxyphenylsilyl, tert-butoxydiphenylsilyl,

With the proviso that:

1. Stereoisomer (2R,3S,4R) cannot have R_9 = benzyl and $R_2 = R_5 = R_{14}$ = hydrogen and R_{13} = tert-butyldimethylsilyl.
2. Stereoisomer (2R,3S,4R) cannot have $R_9 = R_2 = R_5 = R_{14}$ = hydrogen and R_{13} = tert-butyldimethylsilyl.
3. Stereoisomer (2R,3S,4R) cannot have $R_9 = R_2 = R_5 = R_{14}$ = hydrogen and R_{13} = tert-butyldiphenylsilyl.
4. Stereoisomer (2R,3S,4S,5S) cannot have $R_2 = R_5 = R_9$ = hydrogen and R_{13} = tert-butyldiphenylsilyl and R_{14} = p-toluenecarboxy.
5. Stereoisomer (2R,3S,4S,5S) cannot have $R_2 = R_5 = R_9$ = hydrogen and R_{13} = tert-butyldimethylsilyl and R_{14} = tricholoroacetamide.
6. Stereoisomers (2R,3S,4S,5R) and (2S,3R,4R,5S) cannot have $R_2 = R_5 = R_9$ = hydrogen and R_{13} = tert-butyldimethylsilyl and R_{14} = 5,6-dichlorobenzimidazole.

92. Compounds according to claim 90, where R_{13} is selected from the group consisting of benzyl, 2-nitrobenzyl, 2-trifluoromethylbenzyl, 4-methoxybenzyl, 4-nitrobenzyl, 4-chlorobenzyl, 4-bromobenzyl, 4-cyanobenzyl, 4-phenylbenzyl, 4-acylaminobenzyl, 4-azidobenzyl, 4-(methylsulfinyl)benzyl, 2,4-dimethoxybenzyl, 4-azido-3-chlorobenzyl, 3,4-dimethoxybenzyl, 2,6-dichlorobenzyl, 2,6-difluorobenzyl, 1-pyrenylmethyl, diphenylmethyl, 4,4'-dinitrobenzhydryl, 5-benzosuberyl, triphenylmethyl (trityl), α-naphthyldiphenylmethyl, (4-methoxyphenyl)-diphenyl-methyl (MMT), di-(p-methoxyphenyl)-phenylmethyl, tri-(p-methoxyphenyl)methyl, 4-(4'-bromophenacyloxy)-phenyldiphenylmethyl, 4,4',4"-tris(4,5-dichlorophtalimidophenyl)methyl, 4,4',4"-tris(levulinoyloxyphenyl)methyl, 4,4'-dimethoxy-3"-[N-(imidazolylmethyl)]trityl, 4,4'-dimethoxy-3"-[N-(imidazolylethyl)carbamoyl]trityl, 1,1-bis(4-methoxyphenyl)-1'-pyrenylmethyl, 4-(17-tetrabenzo[a,c,g,l]fluorenylmethyl)-4,4'-dimethoxytrityl, 9-anthryl, 9-(9-phenyl)xanthenyl, 9-(9-phenyl-10-oxo)anthryl

With the proviso that:

1. Stereoisomer (2R, 3S, 4S, 5R) cannot have $R_2 = R_5$ = hydrogen and R_9 = benzoyl and R_{13} = (4-methoxyphenyl)-diphenyl-methyl and R_{14} = N-(9H-purin-6-yl)-benzamide.
2. Stereoisomer (2R, 3S, 4S, 5R) cannot have $R_2 = R_5$ = hydrogen and R_9 = benzoyl and R_{13} = (4-methoxyphenyl)-diphenyl-methyl and R_{14} = 1H-pyrimidine-2,4-dione.

3. Stereoisomer (2R, 3S, 4S, 5R) cannot have R_2 = R_5 = hydrogen and R_9 = benzoyl and R_{13} = (4-methoxyphenyl)-diphenyl-methyl and R_{14} = N-(2-oxo-1,2-dihydro-pyrimidin-4-yl)-benzamide.
4. Stereoisomer (2R, 3S, 4S, 5R) cannot have R_2 = R_5 = hydrogen and R_9 = benzoyl and R_{13} = (4-methoxyphenyl)-diphenyl-methyl and R_{14} = N,N-dimethyl-N'-(6-oxo-6,9-dihydro-1H-purin-2-yl)-formamidine.
5. Stereoisomer (2R, 3S, 4R) cannot have R_2 = R_5 = R_9 = R_{14} = hydrogen and R_{13} = triphenylmethyl.
6. Stereoisomer (2R, 3S, 4S) cannot have R_2 = R_5 = R_9 = R_{14} = hydrogen and R_{13} = benzyl.
7. Stereoisomers (2R, 3S, 4R, 5R) and (2R, 3S, 4R, 5S) cannot have R_2 = R_5 = R_9 = hydrogen and R_{13} = triphenylmethyl and R_{14} = hydroxy.
8. Stereoisomer (2R, 3R, 4R) and (2S, 3S, 4S) cannot have R_2 = R_9 = R_{14} = hydrogen and R_5 = methyl and R_{13} = triphenylmethyl.

93. Compounds according to claim 90, where R_{13} is selected from the group consisting of alkyl, substituted alkyl and aryl and more specifically R_{13} is selected from the group consisting of methyl, tert-butyl, allyl, propargyl, p-chlorophenyl, p-methoxyphenyl, p-nitrophenyl, 2,4-dinitrophenyl, 2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl, methoxymethyl, methylthiomethyl, (phenyldimethylsilyl)methoxymethyl, benzyloxymethyl, p-methoxy-benzyloxymethyl, p-nitrobenzyloxymethyl, o-nitrobenzyloxymethyl, (4-methoxyphenoxy)methyl, guaiacolmethyl, tert-butoxymethyl, 4-pentenyloxymethyl, tert-butyldimethylsiloxymethyl, thexyldimethylsiloxymethyl, tert-butyldiphenylsiloxymethyl, 2-methoxyethoxymethyl, 2,2,2-trichloroethoxymethyl, bis(2-chloroethoxy)methyl, 2-(trimethylsilyl)ethoxymethyl, menthoxymethyl, 1-ethoxyethyl, 1-(2-chloroethoxy)ethyl, 1-[2-(trimethylsilyl)ethoxy]ethyl, 1-methyl-1-ethoxyethyl, 1-methyl-1-benzyloxyethyl, 1-methyl-1-benzyloxy-2-fluoroethyl, 1-methyl-1-phenoxyethyl, 2,2,2-trichloroethyl, 1-dianisyl-2,2,2-trichloroethyl, 1,1,1,3,3,3-hexafluoro-2-phenylisopropyl, 2-trimethylsilylethyl, 2-(benzylthio)ethyl, 2-(phenylselenyl)ethyl, tetrahydropyranyl, 3-bromotetrahydropyranyl, tetrahydrothiopyranyl, 1-methoxycyclohexyl, 4-methoxytetrahydropyranyl, 4-methoxytetrahydrothiopyranyl, 4-methoxytetrahydropyranyl S,S-dioxide, 1-[(2-chloro-4-methyl)phenyl]-4-

methoxypiperidin-4-yl, 1-(2-fluorophenyl)-4-methoxypiperidin-4-yl, 1,4-dioxan-2-yl, tetrahydrofuranyl, tetrahydrothiofuranyl,

With the proviso that:

1. Compounds of formula **Q** cannot have $R_2 = R_5 = R_9$ = hydrogen and R_{13} = allyl and R_{14} = hydroxy.
2. Compounds of formula **Q** cannot have $R_2 = R_5$ = hydrogen and $R_9 = R_{13}$ = methyl and R_{14} = methoxy.
3. Stereoisomer (2R,3S,4R,5S) cannot have $R_2 = R_5$ = hydrogen and $R_9 = R_{13}$ = methyl and R_{14} = methoxy.
4. Stereoisomer (2R,3S,4R,5S) cannot have $R_2 = R_5$ = hydrogen and R_9 = benzyl and R_{13} = methyl and R_{14} = hydroxy.
5. Stereoisomer (2R,3S,4R,5S) cannot have $R_2 = R_5$ = hydrogen and R_9 = benzyl and R_{13} = methyl and R_{14} = methoxy.
6. Stereoisomer (2R,3S,4S,5S) cannot have $R_2 = R_5 = R_9$ = hydrogen and R_{13} = methyl and R_{14} = methoxy.
7. Stereoisomer (2R, 3S, 4R) cannot have $R_2 = R_5 = R_{14}$ = hydrogen and $R_9 = R_{13}$ = methyl.

94. Compounds according to claim 90, where R_{13} = -C(O)R^8, where R^8 is selected from the group consisting of alkyl, substituted alkyl and aryl and more specifically R_8 is selected from the group consisting of hydrogen, methyl, ethyl, tert-butyl, adamantyl, crotyl, chloromethyl, dichloromethyl, trichloromethyl, trifluoromethyl, methoxymethyl, triphenylmethoxymethyl, phenoxymethyl, 4-chlorophenoxymethyl, phenylmethyl, diphenylmethyl, 4-methoxycrotyl, 3-phenylpropyl, 4-pentenyl, 4-oxopentyl, 4,4-(ethylenedithio)pentyl, 5-[3-bis(4-methoxyphenyl)hydroxymethylphenoxy]- 4-oxopentyl, phenyl, 4-methylphenyl, 4-nitrophenyl, 4-fluorophenyl, 4-chlorophenyl, 4-methoxyphenyl, 4-phenylphenyl, 2,4,6-trimethylphenyl, α-naphthyl, benzoyl

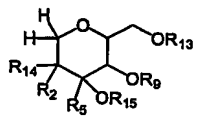
With the proviso that:

1. Stereoisomer (2R,3S,4R,5R) cannot have $R_2 = R_5 = R_9$ = hydrogen and R_{13} = acetyl and R_{14} = N-acetamido.
2. Stereoisomer (2R,3R,4S,5S) cannot have $R_2 = R_5 = R_9$ = hydrogen and R_{13} = acetyl and R_{14} = acetoxy.

3. Stereoisomer (2R,3S,4R) cannot have $R_2 = R_5 = R_{14}$ = hydrogen and $R_9 = R_{13}$ = tert-butylcarbonyl.
4. Stereoisomer (2R,3S,4R) cannot have $R_2 = R_5 = R_9 = R_{14}$ = hydrogen and R_{13} = 1-naphthoyl.
5. Stereoisomer (2R,3S,4R) cannot have $R_2 = R_5 = R_9 = R_{14}$ = hydrogen and R_{13} = 2-naphthoyl.
6. Stereoisomer (2R,3S,4R) cannot have $R_2 = R_5 = R_9 = R_{14}$ = hydrogen and R_{13} = benzoyl.
7. Stereoisomer (2R,3S,4R) cannot have $R_2 = R_5 = R_9 = R_{14}$ = hydrogen and R_{13} = 4-methoxybenzoyl.
8. Stereoisomer (2R, 3S, 4S, 5R) cannot have $R_2 = R_5 = R_9$ = hydrogen and R_{13} = 3,4,5-trihydroxybenzoyl and R_{14} = (3,4,5-trihydroxyphenyl)carboxy.
9. Stereoisomer (2R, 3S, 4R, 5R) cannot have $R_2 = R_5 = R_9$ = hydrogen and R_{13} = benzoyl and R_{14} = phenylcarboxy.
10. Stereoisomer (2R, 3R, 4R, 5R) cannot have $R_2 = R_5 = R_9$ = hydrogen and R_{13} = benzoyl and R_{14} = phenylcarboxy.
11. Stereoisomer (2R, 3S, 4R, 5R) cannot have $R_2 = R_5$ = hydrogen and $R_9 = R_{13}$ = benzoyl and R_{14} = phenylcarboxy.
12. Stereoisomer (2R, 3S, 4R, 5R) cannot have $R_2 = R_5$ = hydrogen and $R_9 = R_{13}$ = benzoyl and R_{14} = hydroxy.
13. Compounds of formula **Q** cannot have $R_2 = R_5 = R_9$ = hydrogen and R_{13} = 3-(3,4,5-trimethoxyphenyl)acryloyl and R_{14} = hydroxy.
14. Compounds of formula **Q** cannot have $R_2 = R_5 = R_9$ = hydrogen and R_{13} = formyl and R_{14} = hydroxy.
15. Compounds of formula **Q** cannot have $R_2 = R_5 = R_9$ = hydrogen and R_{13} = ethylcarbonyl and R_{14} = hydroxy.
16. Compounds of formula **Q** cannot have $R_2 = R_5 = R_9$ = hydrogen and R_{14} = hydroxy and R_{13} = aminomethylcarbonyl.
17. Compounds of formula **Q** cannot have $R_2 = R_5 = R_9$ = hydrogen and R_{14} = hydroxy and R_{13} = 10-aminodecylcarbonyl.
18. Compounds of formula **Q** cannot have $R_2 = R_5 = R_9$ = hydrogen and R_{14} = hydroxy and R_{13} = 5-aminopentylcarbonyl.
19. Compounds of formula **Q** cannot have $R_2 = R_5 = R_9$ = hydrogen and R_{14} = hydroxy and R_{13} = succinoyl.

20. Compounds of formula **Q** cannot have $R_2 = R_5 = R_9$ = hydrogen and R_{13} = 3,4,5-trihydroxybenzoyl and R_{14} = hydroxy.

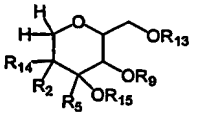
95. Compounds of formula **Q**, where:



Q

a) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl
b) R_9, R_{13} are independently selected from the group consisting of hydrogen, alkylcarbonyl, substituted alkylcarbonyl, arylcarbonyl and hydroxyl protecting group.
c) R_{14} is cyano.
d) R_{15} is selected from the group consisting of hydrogen, trimethylsilyl, tert-butyldimethylsilyl, alkylcarbonyl, substituted alkylcarbonyl, arylcarbonyl and hydroxyl protecting group

96. Compounds of formula **Q**, where:



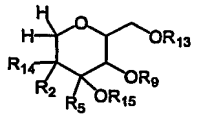
Q

a) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl
b) R_9, R_{13} and R_{15} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl, aryl, alkylcarbonyl, substituted alkylcarbonyl, arylcarbonyl, trimethylsilyl, tert-butyldimethylsilyl and hydroxyl protecting group.
c) R_{14} is selected from the group consisting of alkylthio and arylthio

With the proviso that:

1. Stereoisomer (2R,3R,4S,5R) and (2R,3R,4S,5S) cannot have $R_2 = R_5 =$ hydrogen, $R_9 = R_{13} = R_{15}$ = acetyl, and R_{14} = ethylthio.
2. Stereoisomer (2R,3R,4S,5R) and (2R,3R,4S,5S) cannot have $R_2 = R_5 =$ hydrogen, $R_9 = R_{13} = R_{15}$ = acetyl, and R_{14} = n-propylthio.
3. Stereoisomers (2R,3S,4S,5R) and (2R,3S,4S,5S) cannot have $R_2 = R_5 = R_9 = R_{13} = R_{15}$ = hydrogen and R_{14} = benzylthio.
4. Stereoisomers (2R,3R,4S,5R) and (2R,3R,4S,5S) cannot have $R_2 = R_5 =$ hydrogen, $R_9 = R_{13} = R_{15}$ = acetyl, and R_{14} = benzylthio.

97. Compounds of formula **Q**, where:



Q

a) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

b) R_9 is selected from the group consisting of hydrogen, alkyl, substituted alkyl, aryl, alkylcarbonyl, substituted alkylcarbonyl, arylcarbonyl, trimethylsilyl, tert-butyldimethylsilyl, and hydroxyl protecting group.

c) R_{13} is selected from the group consisting of alkyl, substituted alkyl, aryl, alkylcarbonyl, substituted alkylcarbonyl, arylcarbonyl, trimethylsilyl, tert-butyldimethylsilyl and hydroxyl protecting group.

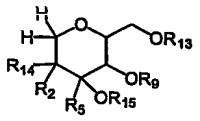
d) R_{15} is hydrogen

e) R_{14} is NHR_{18} where R_{18} is selected from the group consisting of hydrogen, alkyl, substituted alkyl, aryl, alkylcarbonyl, substituted alkylcarbonyl, arylcarbonyl and amino protecting group.

With the proviso that:

1. Stereoisomers (2R,3S,4R,5R) cannot have $R_2 = R_5 = R_9 = R_{15}$ = hydrogen, R_{13} = acetyl, and R_{14} = acetamido.
2. Stereoisomers (2R,3S,4S,5S) and (2R,3R,4R,5S) cannot have $R_2 = R_5 = R_9 = R_{15}$ = hydrogen, R_{13} = tert-butyltrimethylsilyl, and R_{14} = trichloroacetamido.

98. Compounds of formula **Q**, where:



Q

a) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

b) R_9 and R_{15} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl, aryl, alkylcarbonyl, substituted alkylcarbonyl, arylcarbonyl, trimethylsilyl, tert-butyldimethylsilyl and hydroxyl protecting group.

c) R_{13} is selected from the group consisting of alkyl, substituted alkyl, aryl, alkylcarbonyl, substituted alkylcarbonyl, arylcarbonyl, trimethylsilyl, tert-butyldimethylsilyl and hydroxyl protecting group.

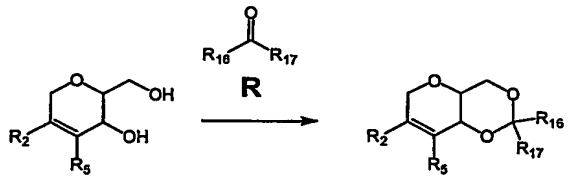
d) R_{14} is selected from the group consisting of phathalimide, substituted phathlimide, maleimide, substituted maleimide and $NR_{18}R_{19}$ where R_{18} and R_{19} are independently selected from the group consisting of alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl, heteroaryl, saturated heteroaryl and amino protecting group and R_{18} and R_{19} maybe taken together with the nitrogen to which they are attached forming a cyclic system containing 3 to 10 carbon atoms with at least one substituent as defined for a substituted alkyl.

With the proviso that:

1. Stereoisomer (2R,3R,4R,5S) cannot have $R_2 = R_5$ = hydrogen, $R_9 = R_{13} = R_{15}$ = acetyl, and R_{14} = phthalimido.
2. Stereoisomer (2R,3S,4R,5S) cannot have $R_2 = R_5 = R_9 = R_{13} = R_{15}$ = hydrogen, and R_{14} = dimethylamino hydrogen chloride.
3. Stereoisomer (2R,3S,4R,5S) cannot have $R_2 = R_5 = R_9 = R_{13} = R_{15}$ = hydrogen, and R_{14} = trimethylaminoiodide.
4. Stereoisomer (2R,3S,4R,5S) cannot have $R_2 = R_5 = R_9 = R_{13} = R_{15}$ = hydrogen, and R_{14} = N,N-(benzyloxycarboxy)methylamino.

99. All stereoisomers of the compounds selected from the group consisting of 5-benzylamino-2-(tert-butyldimethylsilanyloxymethyl)-tetrahydropyran-3,4-diol, 2-(tert-butyldimethylsilanyloxymethyl)-5-(3-methoxyphenylamino)-tetrahydropyran-3,4-diol, 2-hydroxymethyl-5-phenylsulfanyl-tetrahydropyran-3,4-diol, 6-(tert-butyldimethylsiloxymethyl)-5-hydroxy-4(-trimethylsiloxy)-tetrahydropyran-3-carbonitrile, 6-(tert-butyldimethylsiloxymethyl)-5-hydroxy-4(-tert-butyldimethylsiloxy)-tetrahydropyran-3-carbonitrile, 5-benzyloxy-2-(tert-butyldimethylsilanyloxymethyl-tetrahydropyran-3,4-diol, 2-(tert-butyldimethylsilanyloxymethyl)-tetrahydropyran-3,5-diol, and 5-azido-2-(tert-butyldimethylsilanyloxymethyl)-tetrahydropyran-3,4-diol

100. A process for preparing compound of formula **S** comprising contacting compound of formula **N** with compound of formula **R** under conditions suitable to produce compound of formula **S**, where:



N **S**

R_2, R_5, R_{16} and R_{17} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

101. A process according to claim 100 where the reaction is carried out in a solvent or in mixtures of solvents selected from the group consisting of acetonitrile, dichloromethane, dichloroethane, diethyl ether, dioxane, tetrahydrofuran, benzene, toluene, dichlorobenzene and xylene.

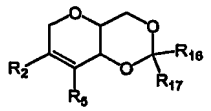
102. A process according to claim 100 where the reaction is carried out between 0°C and 150°C.

103. A process according to claim 100 where compound of formula **N** is contacted with an acid and compound of formula **R** under conditions suitable to produce compound of formula **S**, more specifically where the acid is selected from the

group consisting of formic acid, acetic acid, fumaric acid, phthalic acid, oxalic acid, pyridinium p-toluenesulfonate, p-toluenesulfonic acid, methanesulfonic acid, Montmorillonite Clay K-10, Montmorillonite Clay KSF, ammonium chloride, sulfuric acid, phosphoric acid, hydrochloric acid, hydrobromic acid and hydroiodic acid.

104. A process according to claim 100 where compound of formula **N** is contacted with a Lewis acid and compound of formula **R** under conditions suitable to produce compound of formula **S**, more specifically where the Lewis acid is selected from the group consisting of boron trifluoride, trimethylsilyl chloride, trimethylsilylbromide, trimethylsilyl iodide, trimethylsilyl trifluoromethylsulfonate, cerium (III) chloride, scandium (III) trifluoromethanesulfonate, yttrium (III) trifluoromethanesulfonate, ytterbium (III) trifluoromethanesulfonate, lanthanum (III) trifluoromethane-sulfonate, iron (III) chloride, zinc (II) chloride, zinc (II) bromide, zinc (II) iodide, zinc (II) trifluoromethanesulfonate, zinc (II) sulfate, magnesium sulfate, lithium perchlorate, copper (II) trifluoromethanesulfonate, and copper (II) tetrafluoroborate.

105. Compounds of formula **S**, where:



S

R_2, R_5, R_{16} and R_{17} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

With the proviso that:

1. Stereoisomer (4aR,8aS) cannot have $R_2 = R_5 = R_{16}$ = hydrogen and R_{17} = phenyl
2. Stereoisomer (4aR,8aS) cannot have $R_2 = R_{16}$ = hydrogen, R_5 = (4-methoxyphenyl)-diphenylmethoxymethyl and R_{17} = phenyl

106. All stereoisomers of compounds of formula **S**, where $R_2 = R_5$ = hydrogen and $R_{16} = R_{17}$ = methyl, specifically compounds selected from the group consisting of

(4aR,8aR)-2,2-dimethyl-4,4a,6,8a-tetrahydropyrano[3,2-d][1,3]dioxine, (4aS,8aS)-2,2-dimethyl-4,4a,6,8a-tetrahydropyrano[3,2-d][1,3]dioxine, (4aR,8aS)-2,2-dimethyl-4,4a,6,8a-tetrahydropyrano[3,2-d][1,3]dioxine, and (4aS,8aR)-2,2-dimethyl-4,4a,6,8a-tetrahydropyrano[3,2-d][1,3]dioxine.

107. A process for preparing compound of formula **T** comprising contacting compound of formula **S** under conditions suitable to produce compound of formula **T**, where:

S **T**

R_2, R_5, R_{16} and R_{17} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

With the proviso that

1. For compounds of formula **S**, stereoisomer (4aR,8aS) cannot have R_2 = R_5 = hydrogen and R_{16} = R_{17} = methyl

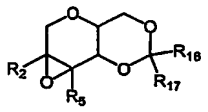
108. A process according to claim 107 where compound of formula **S** is contacted with any suitable mixtures of compounds selected from the group consisting of oxygen, tert-butyl hydroperoxide, meta-chloroperbenzoic acid, dimethyl dioxirane, oxone, acetone, sodium hypochlorite, sodium periodate, iodosylbenzene, titanium tetraisopropoxide, polymer supported cyclopentadienyl titanium trichloride, zirconium tetraethoxide, hafnium tetraisopropoxide, vanadium pentoxide, niobium pentaethoxide, tantalum pentaisopropoxide, manganese (II) trifluoromethanesulfonate, iron (III) acetylacetonate, molybdenum hexacarbonyl, ruthenium dichloride tris(triphenylphosphine), cobalt (II) trifluoromethanesulfonate, (R,R) diethyl tartarate, (S,S) diethyl tartarate, N-ethyl ephedrine, N-methylprolinol, porphyrin, 2,2'-[[(1S,2S)-1,2-diphenyl-1,2-ethanediyl]-bis(nitrilomethylidyne)]bis[6-(1,1-dimethylethyl)-4-methyl-phenol, 2,2'-[[(1R,2R)-1,2-diphenyl-1,2-ethanediyl]-bis(nitrilomethylidyne)]bis[6-(1,1-dimethylethyl)-4-methyl-phenol, and 2,2'-

[(1R,2R)-1,2-cyclohexanediylbis[(E)-nitrilomethylidyne]]bis[6-(1,1-dimethylethyl)-4-methyl-phenol under conditions suitable to produce compound of formula **T**.

109. A process according to claim 107 where the reaction is carried out in a solvent or in mixtures of solvents selected from the group consisting of acetonitrile, dichloromethane, dichloroethane, diethyl ether, dioxane, tetrahydrofuran, dimethyl formamide, dimethyl acetamide, N-methylpyrrolidine, dimethyl sulfoxide, benzene, toluene, dichlorobenzene, xylene, methanol, ethanol, isopropanol and water.

110. A process according to claim 107 where the reaction is carried out between -100°C and 100°C

111. Compounds of formula **T**, where:



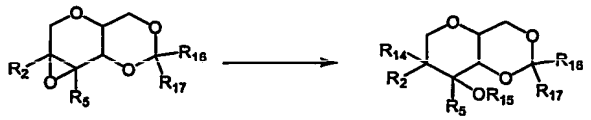
T

R_2, R_5, R_{16} and R_{17} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

With the proviso that:

1) Stereoisomer (1aR,3aR,7aR,7bR) cannot have $R_2 = R_5 = R_{16}$ = hydrogen and R_{17} = phenyl
2) Stereoisomer (1aS,3aR,7aR,7bS) cannot have $R_2 = R_5 = R_{16}$ = hydrogen and R_{17} = phenyl
3) Stereoisomer (1aR,3aS,7aS,7bR) cannot have $R_2 = R_5 = R_{16}$ = hydrogen and R_{17} = phenyl

112. A process for preparing compound of formula **U** comprising contacting compound of formula **T** with a nucleophile under conditions suitable to produce compound of formula **U**, where:



T U

a) R_2, R_5, R_{16} and R_{17} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl.
b) R_{14} is selected from the group consisting of hydrogen, halogen, alkyl, substituted alkyl, aryl, heteroaryl, saturated heteroaryl, cyano, azido, amino, alkylamino, arylamino, hydrazino, alkylhydrazino, arylhydrazino, alkylcarbonylhydrazino, arylcarbonylhydrazino, hydroxy, alkoxy, aryloxy, alkylthio, arylthio, alkylcarboxy, arylcarboxy, N-protected amino acid, O-protected amino acid and a solid support.
c) R_{15} is selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group.

With the proviso that For compounds of formula **T**, stereoisomer (1aS,3aR,7aR,7bS) cannot have $R_2 = R_5 = R_{16}$ = hydrogen and R_{17} = phenyl

113. A process according to claim 112 where the reaction is carried out in a solvent or in mixtures of solvents selected from the group consisting of acetonitrile, dichloromethane, dichloroethane, diethyl ether, dioxane, tetrahydrofuran, dimethyl formamide, dimethyl acetamide, N-methylpyrrolidine, dimethyl sulfoxide, benzene, toluene, dichlorobenzene, xylene, methanol, ethanol, isopropanol and water.

114. A process according to claim 112 where the reaction is carried out between -100°C and 150°C.

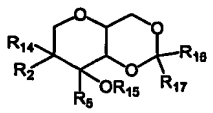
115. A process according to claim 112 where compound of formula **T** is contacted with a nucleophile and a Lewis acid, more specifically where the Lewis acid is selected from the group consisting of boron trifluoride, boron trifluoride etherate, boron trifluoride tetrahydrofuran complex, boron trifluoride tert-butyl-methyl

ether complex, boron trifluoride dibutyl ether complex, boron trifluoride dihydrate, boron trifluoride di-acetic acid complex, boron trifluoride dimethyl sulfide complex, boron trichioride, boron trichioride dimethyl sulfide complex, boron tribromide, boron tribromide dimethyl sulfide complex, boron triiodide, trimethoxyborane, triethoxyborane, trimethylaluminum, triethylaluminum, aluminum trichloride, aluminum trichloride tetrahydrofuran complex, aluminum tribromide, titanium tetrachloride, titanium tetrabromide, titanium iodide, titanium tetraethoxide, titanium tetraisopropoxide, scandium (III) trifluoromethanesulfonate, yttrium (III) trifluoromethanesulfonate, ytterbium (III) trifluoromethanesulfonate, lanthanum (III) trifluoromethane-sulfonate, zinc (II) chloride, zinc (II) bromide, zinc (II) iodide, zinc (II) trifluoromethanesulfonate, zinc (II) sulfate, magnesium sulfate, lithium perchlorate, copper (II) trifluoromethanesulfonate, and copper (II) tetrafluoroborate, and where the nucleophile is selected from a group consisting of hydride, halogen, halide, cyanide, azide, water, hydroxide, alkylhydroxy, substituted alkylhydroxy, arylhydroxy, alkyloxide, substituted alkyloxide, aryloxide, ammonia, an ionic salt of ammonia, alkylamine, dialkylamine, substituted alkylamine, substituted dialkylamine, arylamine, diarylamine, alkylamine anion, dialkylamine anion, substituted alkylamine anion, substituted dialkylamine anion, arylamine anion, diarylamine anion, hydrazine, alkylhydrazine, arylhydrazine, alkylcarbonylhydrazine, arylcarbonylhydrazino, hydrazine anion, alkylhydrazine anion, arylhydrazine anion, alkylcarbonyl-hydrazine anion, arylcarbonylhydrazine anion, a nitrogen containing saturated heterocycle, a nitrogen containing saturated heterocycle anion, a nitrogen containing heteroaryl, a nitrogen containing heteroaryl anion, phthalimide, substituted phthalimide, maleimide, substituted maleimide, phathalimide anion, substituted phathlimide anion, maleimide anion, substituted maleimide anion, an O-protected amino acid, an O-protected amino acid anion, N-protected amino acid, N-protected amino acid anion, alkyl anion, substituted alkyl anion, aryl anion, a solid support, an anion of a solid support, compound of formula **N**, and an anion of compound of formula **N**.

116. A process according to claim 112 where the nucleophile is derived from an organometallic reagent where the metal is selected from the group consisting of

lithium, magnesium, aluminum, boron, cobalt, copper, iron, mercury, nickel, palladium, platinum, rhodium, titanium, zinc and zirconium.

117. Compounds of formula **U**, where:



U

a) R_2, R_5, R_{16} and R_{17} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl.

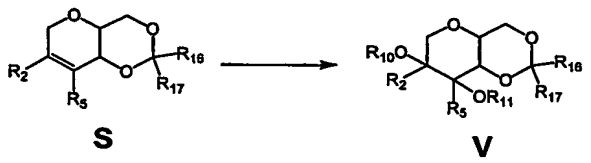
b) R_{14} is selected from the group consisting of hydrogen, halogen, alkyl, substituted alkyl, aryl, heteroaryl, saturated heteroaryl, cyano, azido, amino, alkylamino, arylamino, hydrazino, alkylhydrazino, arylhydrazino, alkylcarbonylhydrazino, arylcarbonylhydrazino, hydroxy, alkoxy, aryloxy, alkylthio, arylthio, alkylcarboxy, arylcarboxy, N-protected amino acid, O-protected amino acid and a solid support.

c) R_{15} is selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group.

With the proviso that

1) If R_{16} is methyl then R_{17} cannot be methyl
2) If R_{16} is hydrogen then R_{17} cannot be phenyl
3) If $R_2 = R_5 = R_{15} = R_{16}$ = hydrogen and R_{14} = hydroxy then R_{17} cannot be 3-nitrophenyl.
4) If $R_2 = R_5 = R_{14} = R_{15} = R_{16}$ = hydrogen then R_{17} cannot be 4-nitrophenyl.
5) If $R_2 = R_5 = R_{14} = R_{15} = R_{16}$ = hydrogen then R_{17} cannot be 4-methoxyphenyl.
6) If $R_2 = R_5 = R_{16}$ = hydrogen and R_{14} = methoxy and R_{15} = methyl then R_{17} cannot be 4-methoxyphenyl.
7) If $R_2 = R_5 = R_{15} = R_{16}$ = hydrogen and R_{14} = hydroxy then R_{17} cannot be 4-methoxyphenyl.

118. A process for preparing compound of formula **V** comprising contacting compound of formula **S** under conditions suitable to produce compound of formula **V**, where:



S **V**

a) R_2, R_5, R_{16} and R_{17} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl.

b) R_{10} and R_{11} are hydrogen

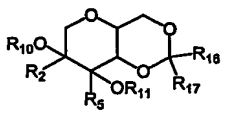
With the proviso that for compounds of formula **S**, stereoisomer (4aR,8aS) cannot have R_{16} = hydrogen and R_{17} = phenyl

119. A process according to claim 118 where the compound of formula **S** is contacted with any suitable mixtures of compounds selected from the group consisting of osmium tetroxide, potassium permanganate, thallium acetate, potassium periodate, silver acetate, N-methylmorpholine oxide, trimethylamine oxide, tert-butyl peroxide, iodine, potassium ferricyanide, pyridine, quinuclidine, dihydroquinine acetate, dihydroquinidine acetate, dihydroquinine anthraquinone-1,4-diyl diether ($(DHQ)_2AQN$), dihydroquinine phthalazine-1,4-diyl diether ($(DHQ)_2PHAL$), dihydroquinine 2,5-diphenyl-4,6-pyrimidinediyl diether ($(DHQ)_2PYR$), dihydroquinidine anthraquinone-1,4-diyl diether ($(DHQD)_2AQN$), dihydroquinidine phthalazine-1,4-diyl diether ($(DHQD)_2PHAL$), dihydroquinidine 2,5-diphenyl-4,6-pyrimidinediyl diether ($(DHQD)_2PYR$), tetraethyl ammonium hydroxide, tetraethyl ammonium acetate, and N,N,N'N'-tetramethylethylene diamine under conditions suitable to produce compound of formula **V**.

120. A process according to claim 118 where the reaction is carried out in a solvent or in mixtures of solvents selected from the group consisting of dichloromethane, water, 2-methyl-2-propanol and tetrahydrofuran

121. A process according to claim 118 where the reaction is carried out between -78°C and 60°C

122. Compound of formula **V**, where:



V

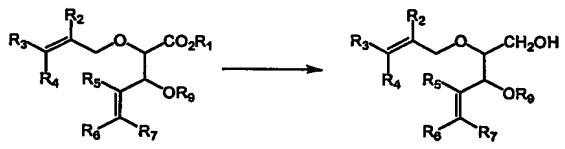
a) R_2, R_5, R_{16} and R_{17} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl.
b) R_{10} and R_{11} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group.

With the proviso that:

1. If R_{16} is methyl then R_{17} cannot be methyl
2. If R_{16} is hydrogen then R_{17} cannot be phenyl
3. If $R_2 = R_5 = R_{10} = R_{11} = R_{16}$ = hydrogen then R_{17} cannot be 3-nitrophenyl.
4. If $R_2 = R_5 = R_{16}$ = hydrogen and R_{14} = hydroxy then R_{17} cannot be 4-methoxyphenyl.
5. If $R_2 = R_5 = R_{16}$ = hydrogen and $R_{10} = R_{11}$ = methyl then R_{17} cannot be 4-methoxyphenyl.

123. All stereoisomers of compound of formula **V**, where $R_2 = R_5 = R_{10} = R_{11}$ = hydrogen and $R_{16} = R_{17}$ = methyl, and compounds selected from the group consisting of (4aS,7R,8R,8aR)-2,2-dimethyl-hexahydropyrano[3,2-d][1,3]dioxine-7,8-diol, (4aS,7S,8S,8aR)-2,2-dimethyl-hexahydropyrano[3,2-d][1,3]dioxine-7,8-diol, (4aR,7R,8R,8aS)-2,2-dimethyl-hexahydropyrano[3,2-d][1,3]dioxine-7,8-diol, (4aS,7R,8R,8aS)-2,2-dimethyl-hexahydropyrano[3,2-d][1,3]dioxine-7,8-diol, (4aR,7S,8S,8aR)-2,2-dimethyl-hexahydropyrano[3,2-d][1,3]dioxine-7,8-diol, (4aS,7S,8S,8aS)-2,2-dimethyl-hexahydropyrano[3,2-d][1,3]dioxine-7,8-diol,and (4aR,7R,8R,8aR)-2,2-dimethyl-hexahydropyrano[3,2-d][1,3]dioxine-7,8-diol.

124. A process for preparing compound of formula **W** comprising contacting compound of formula **G** under conditions suitable to produce compound of formula **W**, where:



G **W**

a) R_1 is selected from the group consisting of alkyl, substituted alkyl and aryl

b) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

c) $R_3 = R_4 = R_6 = R_7$ = hydrogen or R_3, R_4, R_6, R_7 are selected such that three out of four are hydrogen and the fourth is selected from the group consisting of alkyl, substituted alkyl and aryl

d) R_9 is selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group

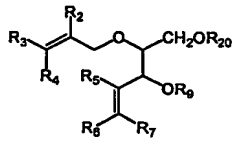
125. A process according to claim 124 where compound of formula **G** is contacted with a compound selected from the group consisting of borane-dimethyl sulfide complex, 9-borabicyclo[3.3.1.]nonane (9-BBN), catechol borane, lithium borohydride, sodium borohydride, sodium borohydride-methanol complex, potassium borohydride, sodium hydroxyborohydride, lithium triethylborohydride, lithium n-butylborohydride, sodium cyanoborohydride, calcium (II) borohydride, lithium aluminum hydride, diisobutylaluminum hydride, n-butyl-diisobutylaluminum hydride, sodium bis-methoxyethoxyaluminum hydride, triethoxysilane, diethoxymethylsilane, lithium hydride, lithium, sodium, and hydrogen Ni/B, under conditions suitable to produce compound of formula **W**.

126. A process according to claim 124 where the reaction is carried out in a solvent or in mixtures of solvents selected from the group consisting of water, methanol, ethanol, isopropanol, diethyl ether, dioxane and tetrahydrofuran.

127. A process according to claim 124 where the reaction is carried out between -100°C and 100°C

128. A process according to claim 124 where R_1 = ethyl and $R_2 = R_3 = R_4 = R_5 = R_6 = R_7 = R_9$ = hydrogen

129. Compounds of formula **W**, where:



W

a) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl
b) $R_3 = R_4 = R_6 = R_7$ = hydrogen or R_3, R_4, R_6, R_7 are selected such that three out of four are hydrogen and the fourth is selected from the group consisting of alkyl, substituted alkyl and aryl
c) R_9 and R_{20} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group

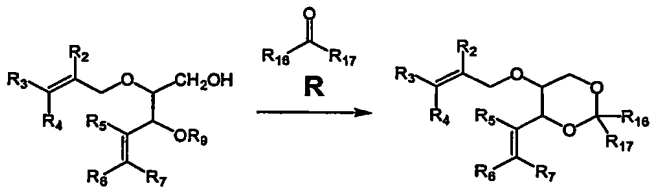
With the proviso that:

1) Stereoisomer (2R,3R) cannot have $R_3 = R_4 = R_6 = R_7 = R_9 = R_{20}$ = hydrogen
2) Stereoisomer (2R,3R) cannot have $R_3 = R_4 = R_6 = R_7$ = hydrogen and $R_9 = R_{20}$ = benzoyl
3) Stereoisomer (2R,3R) cannot have $R_3 = R_4 = R_7 = R_9 = R_{20}$ = hydrogen and R_6 = methyl

4) Stereoisomer (2R,3R) cannot have $R_3 = R_4 = R_7$ = hydrogen and R_6 = methyl and $R_9 = R_{20}$ = benzoyl
5) If R_{20} = benzyl then R_3, R_4, R_6, R_7, R_9 cannot be hydrogen

130. All stereoisomers of compounds of formula **W**, where R_1 = ethyl and $R_2 = R_3 = R_4 = R_5 = R_6 = R_7 = R_9$ = hydrogen and compounds selected from the group consisting of (2S,3S)-2-allyloxy-pent-4-ene-1,3-diol, (2R,3S)-2-allyloxy-pent-4-ene-1,3-diol, and (2S,3R)-2-allyloxy-pent-4-ene-1,3-diol.

131. A process for preparing compound of formula **X** comprising contacting compound of formula **W** with compound of formula **R** under conditions suitable to produce compound of formula **X**, where:



a) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl
b) $R_3 = R_4 = R_6 = R_7$ = hydrogen or R_3, R_4, R_6, R_7 are selected such that three out of four are hydrogen and the fourth is selected from the group consisting of alkyl, substituted alkyl and aryl
c) R_{16} and R_{17} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

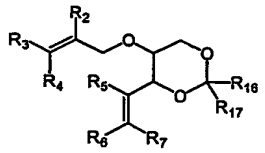
132. A process according to claim 131 where the reaction is carried out in a solvent or in mixtures of solvents selected from the group consisting of acetonitrile, dichloromethane, dichloroethane, diethyl ether, dioxane, tetrahydrofuran, benzene, toluene, dichlorobenzene and xylene.

133. A process according to claim 131 where the reaction is carried out between 0°C and 150°C.

134. A process according to claim 131 where compound of formula **W** is contacted with compound of formula **R** and an acid, more specifically where the acid is selected from the group consisting of formic acid, acetic acid, fumaric acid, phthalic acid, oxalic acid, pyridinium p-toluenesulfonate, p-toluenesulfonic acid, methanesulfonic acid, Montmorillonite Clay K-10, Montmorillonite Clay KSF, ammonium chloride, sulfuric acid, phosphoric acid, hydrochloric acid, hydrobromic acid and hydroiodic acid.

135. A process according to claim 131 where compound of formula **W** is contacted with compound of formula **R** and a Lewis acid, more specifically where the Lewis acid selected from the group consisting of boron trifluoride, trimethylsilyl chloride, trimethylsilylbromide, trimethylsilyl iodide, trimethylsilyl trifluoromethyl-sulfonate, cerium (III) chloride, scandium (III) trifluoromethane-sulfonate, yttrium (III) trifluoromethanesulfonate, ytterbium (III) trifluoromethanesulfonate, lanthanum (III) trifluoromethanesulfonate, iron (III) chloride, zinc (II) chloride, zinc (II) bromide, zinc (II) iodide, zinc (II) trifluoromethanesulfonate, zinc (II) sulfate, magnesium sulfate, lithium perchlorate, copper (II) trifluoromethane-sulfonate, and copper (II) tetrafluoroborate.

136. Compounds of formula **X**, where:



X

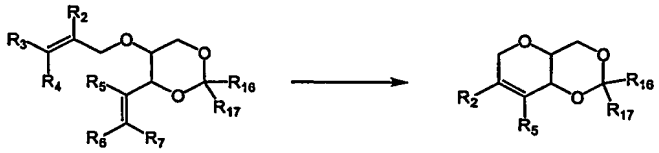
a) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

b) $R_3 = R_4 = R_6 = R_7$ = hydrogen or R_3, R_4, R_6, R_7 are selected such that three out of four are hydrogen and the fourth is selected from the group consisting of alkyl, substituted alkyl and aryl

c) R_{16} and R_{17} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

137. All stereoisomer of compounds of formula **X**, where $R_2 = R_3 = R_4 = R_5 = R_6 = R_7$ = hydrogen and $R_{16} = R_{17}$ = methyl, and compounds selected from the group consisting (5R,6R)-5-allyloxy-2,2-dimethyl-4-vinyl-[1,3]dioxane, (5S,6S)-5-allyloxy-2,2-dimethyl-4-vinyl-[1,3]dioxane, (5S,6R)-5-allyloxy-2,2-dimethyl-4-vinyl-[1,3]dioxane, and (5R,6S)-5-allyloxy-2,2-dimethyl-4-vinyl-[1,3]dioxane

138. A process for preparing compound of formula **S** comprising contacting compound of formula **X** under conditions suitable to produce compound of formula **S**, where:



X **S**

R_2, R_5, R_{16} and R_{17} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

139. A process according to claim 138 where compound of formula **X** is contacted with a ring-closing metathesis catalyst under conditions suitable to produce compound of formula **S**.

140. A process according to claim 138 where compound of formula **X** is contacted with a ring-closing metathesis catalyst that contains a metal atom selected from the group consisting of ruthenium and molybdenum under conditions suitable to produce compound of formula **S**.

141. A process according to claim 138 where carboxylic ester of formula **X** is contacted with a ring-closing metathesis catalyst selected from the group consisting of 2,6-diisopropylphenylimidoneophylidene molybdenum (IV) bis-(tert-butoxide), 2,6-diisopropylphenylimidoneophylidene molybdenum (IV) bis-

(hexafluoro-tert-butoxide), 2,6-diisopropylphenylimidoneophylidene[racemic-BIPHEN] molybdenum (IV), 2,6-diisopropylphenylimidoneophylidene[(R)-(+)-BIPHEN] molybdenum (IV), 2,6-diisopropylphenylimidoneophylidene[(S)-(-)-BIPHEN] molybdenum (IV), bis-(tricyclohexylphosphine)benzylidine ruthenium (IV) dichloride, bis-(tricyclohexylphosphine)-3-methyl-2-butenylidene ruthenium (IV) dichloride, bis-(tricyclopentylphosphine)benzylidine ruthenium (IV) dichloride, bis-(tricyclopentylphosphine)-3-methyl-2-butenylidene ruthenium (IV) dichloride, tricyclohexylphosphine-(1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene)-benzylidine ruthenium (IV) dichloride, tricyclohexylphosphine-(1,3-bis(2,6-diisopropylphenyl)-4,5-dihydroimidazol-2-ylidene)-benzylidine ruthenium (IV) dichloride, (1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene)-2-isopropoxyphenylmethylene ruthenium (IV) dichloride, (tricyclopentylphosphine)-2-isopropoxyphenylmethylene ruthenium (IV) dichloride, and (tricyclopentylphosphine)-2-methoxy-3-naphthylmethylene ruthenium (IV) dichloride under conditions suitable to produce compound of formula **S**.

142. A process according to claim 138 where carboxylic ester of formula **X** is contacted with a ring-closing metathesis catalyst selected from the group consisting of 2,6-diisopropylphenylimidoneophylidene molybdenum (IV) bis-(tert-butoxide), 2,6-diisopropylphenylimidoneophylidene molybdenum (IV) bis-(hexafluoro-tert-butoxide), 2,6-diisopropylphenylimidoneophylidene[racemic-BIPHEN] molybdenum (IV), 2,6-diisopropylphenylimidoneophylidene[(R)-(+)-BIPHEN] molybdenum (IV), and 2,6-diisopropylphenylimidoneophylidene[(S)-(-)-BIPHEN] molybdenum (IV) under conditions suitable to produce compound of formula **S**.

143. A process according to claim 138 where carboxylic ester of formula **X** is contacted with a ring-closing metathesis catalyst selected from the group consisting of bis-(tricyclohexylphosphine)benzylidine ruthenium (IV) dichloride, bis-(tricyclohexylphosphine)-3-methyl-2-butenylidene ruthenium (IV) dichloride, bis-(tricyclopentylphosphine)benzylidine ruthenium (IV) dichloride, bis-(tricyclopentylphosphine)-3-methyl-2-butenylidene ruthenium (IV) dichloride, tricyclohexylphosphine-(1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene)-benzylidine ruthenium (IV) dichloride, tricyclohexylphosphine-(1,3-

bis(2,6-diisopropylphenyl)-4,5-dihydroimidazol-2-ylidene)-benzylidine ruthenium (IV) dichloride, (1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene)-2-isopropoxyphenylmethylene ruthenium (IV) dichloride, (tricyclopentylphosphine)-2-isopropoxyphenylmethylene ruthenium (IV) dichloride, and (tricyclopentylphosphine)-2-methoxy-3-naphthylmethylene ruthenium (IV) dichloride under conditions suitable to produce compound of formula **S**.

144. A process according to claim 138 where carboxylic ester of formula **X** is contacted with a ring-closing metathesis catalyst selected from the group consisting of tricyclohexylphosphine-(1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene)-benzylidine ruthenium (IV) dichloride, tricyclohexylphosphine-(1,3-bis(2,6-diisopropylphenyl)-4,5-dihydroimidazol-2-ylidene)-benzylidine ruthenium (IV) dichloride, (1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene)-2-isopropoxyphenylmethylene ruthenium (IV) dichloride, (tricyclopentylphosphine)-2-isopropoxyphenylmethylene ruthenium (IV) dichloride, and (tricyclopentylphosphine)-2-methoxy-3-naphthylmethylene ruthenium (IV) dichloride under conditions suitable to produce compound of formula **S**.

145. A process according to claim 138 where compound of formula **X** is contacted with bis(tricyclohexyphosphine)benzylidine ruthenium (IV) dichloride under conditions suitable to produce compound of formula **S**.

146. A process according to claim 138, where the reaction is carried out in a solvent or in mixtures of solvents selected from the group consisting of acetonitrile, dichloromethane, dichloroethane, diethyl ether, dioxane, tetrahydrofuran, dimethyl formamide, dimethyl acetamide, N-methylpyrrolidine, dimethyl sulfoxide, benzene, toluene, dichlorobenzene, xylene, methanol, ethanol, isopropanol and water.

147. A process according to claim 138, where the reaction is carried out between 0°C and 150°C

148. A process according to claim 138 where R_2 =R_3 = R_4 = R_5 = R_6 = R_7 = hydrogen and R_{16} = R_{17} = methyl, or where R_2 =R_3 = R_4 = R_5 = R_7 = hydrogen and R_6 = R_{16} = R_{17} = methyl, or where R_2 =R_3 = R_4 = R_5 = R_7 = hydrogen and R_6 = phenyl and R_{16} = R_{17} = methyl.

149. A process according to claim 138 where the stereoisomers of compound **S** are separated by the use of at least one method selected from the group consisting of chromatography, crystallization, re-crystallization and distillation.

150. A process for preparing compound of formula **P** comprising contacting compound of formula **Y** with a resolving enzyme and an acylating agent under suitable conditions to produce optically pure compound of formula **P**, where:

Y **P**

a) R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl
b) R_9 and R_{13} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group.

151. A process according to claim 150 wherein the enzymatic resolution comprises an enzyme catalyzed transesterification of compound of formula **Y**.

152. A process according to claim 150 wherein the enzymatic resolution involves the use of a lipase, esterase, peptidase, acylase or protease enzyme of mammalian, plant, fungal or bacterial origin.

153. A process according to claim 150 wherein the resolving enzyme is immobilized on solid support.

154. A process according to claim 150 wherein the acylating agent is selected from the group consisting of ethyl acetate, vinyl acetate, vinyl propionate, vinyl butyrate, isopropenyl acetate, 1-ethoxyvinyl acetate, trichloroethyl butyrate, trifluoroethyl butyrate, trifluoroethyl laureate, S-ethyl thiooctanoate, biacetyl monooxime acetate, acetic anhydride, succinic anhydride, amino acid and diketene.

155. A process according to claim 150 wherein the resolving enzyme is selected from the group consisting of Lipase Amano lipase PS-D (immobilized lipase from *Pseudomonas cepacia*), Amano Lipase PS-C (immobilized lipase from *Pseudomonas cepacia*), Roche Chirazyme L-3 (lipase, lyophilizate, from *Candida Rugosa)*, Roche Chirazyme L-3 (purified lipase, lyophilizate, from *Candida Rugosa*), Roche Chirazyme L-3 (purified lipase, carrier-fixed, carrier 2, lyophilizate, from *Candida rugosa*), Roche Chirazyme L-5 (lipase, solution, from *Candida antartica, type A)*, Roche Chirazyme L-5 (lipase, lyophilizate, from *Candida antartica, type A*), Roche Chirazyme L-5 (lipase, carrier-fixed, carrier 1, lyophilizate, from *Candida antartica, type A)*, Roche Chirazyme L-10 (lipase, lyophilizate, from *Alcaligines sp.*), Altus Biologics 8 (lipase from *Mucor meihei*) and Altus Biologics 27 (lipase from *Alcaligenes sp.*).

156. A process according to claim 150 where compound of formula **Y** is contacted with a compound selected from the group consisting of diazomethane, trimethylsilyldiazomethane, alkyl halide, alkyl triflate, alkyl sulfonate, alkylcarbonyl halide, alkylcarbonyl anhydride, arylcarbonyl halide, arylcarbonyl anhydride, alkyl isocyanate, aryl isocyanate, alkyloxycarbonyl halide, aryloxycarbonyl halide, alkylsulfonyl halide, arylsulfonyl halide, trialkylsilyl halide, dialkylarylsilyl halide, alkyldiarylsilyl halide, triarylsilyl halide, dialkyloxyphosphoryl halide and α,β-unsaturated carbonyl.

157. A process according to claim 150 where compound of formula **Y** is contacted with an alkylhydroxy in the presence of a trialkylphosphine or triarylphosphine and a dialkyl azodicarboxylate.

158. A process according to claim 150 where compound of formula **Y** is contacted with a compound selected from the group consisting of alkylcarboxy,

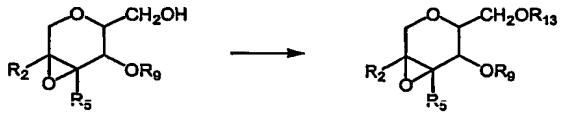
substituted alkylcarboxy, arylcarboxy, substituted arylcarboxy, and amino acid and a compound selected from the group consisting of dicyclohexylcarbodiimide, diisopropyl carbodiimide, 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide, N-hydroxybenzotriazole, N-hydroxysuccinimide, 4-nitrophenol, pentafluorophenol, 2-(1H-benzotriazole-1-yl)-1,1,3,3-tetramethyluronium tetrafluoroborate, O-benzotriazole-N,N,N'N'-tetramethyluronium hexafluorophosphate, benzotriazole-1-yl-oxy-tris-(dimethylamino)-phosphonium hexafluorophosphate, benzotriazole-1-yl-oxy-tris-pyrrolidinophosphonium hexafluorophosphate, bromo-trispyrrolidino-phosphonium hexafluorophosphate, 2-(5-norbornene-2,3-dicarboximido)-1,1,3,3-tetramethyluronium tetrafluoroborate, O-(N-succinimidyl)-1,1,3,3-tetramethyluronium tetrafluoroborate, and tetramethylfluoroformamidinium hexafluorophosphate.

159. A process according to claim 150 where the reaction is carried out in a solvent or in mixtures of solvents selected from the group consisting of acetonitrile, dichloromethane, dichloroethane, diethyl ether, dioxane, tetrahydrofuran, dimethyl formamide, dimethyl acetamide, N-methylpyrrolidine, dimethyl sulfoxide, benzene, toluene, dichlorobenzene, xylene, methanol, ethanol, isopropanol and water.

160. A process according to claim 150 where the reaction is carried out between 0°C and 100°C

161. A process according to claim 150 where the optically pure compound of formula **P** is isolated by the use of at least one method selected from the group consisting of chromatography, crystallization, re-crystallization and distillation.

162. A process for preparing compound of formula **P** comprising contacting compound of formula **Z** with a resolving enzyme and an acylating agent under suitable conditions to produce optically pure compound of formula **P**, where:



Z P

R_2 and R_5 are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl and aryl

R_9 and R_{13} are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl, alkylcarbonyl, substituted alkylcarbonyl, aryl, arylcarbonyl and hydroxyl protecting group.

163. A process according to claim 162 wherein the enzymatic resolution comprises an enzyme catalyzed transesterification of compound of formula **Z**.

164. A process according to claim 162 wherein the enzymatic resolution involves the use of a lipase, esterase, peptidase, acylase or protease enzyme of mammalian, plant, fungal or bacterial origin.

165. A process according to claim 162 wherein the resolving enzyme is immobilized on solid support.

166. A process according to claim 162 wherein the acylating agent is selected from the group consisting of ethyl acetate, vinyl acetate, vinyl propionate, vinyl butyrate, isopropenyl acetate, 1-ethoxyvinyl acetate, trichloroethyl butyrate, trifluoroethyl butyrate, trifluoroethyl laureate, S-ethyl thiooctanoate, biacetyl monooxime acetate, acetic anhydride, succinic anhydride, amino acid and diketene.

167. A process according to claim 162 wherein the resolving enzyme is selected from the group consisting of Lipase Amano lipase PS-D (immobilized lipase from *Pseudomonas cepacia*), Amano Lipase PS-C (immobilized lipase from *Pseudomonas cepacia*), Roche Chirazyme L-3 (lipase, lyophilizate, from *Candida Rugosa)*, Roche Chirazyme L-3 (purified lipase, lyophilizate, from *Candida Rugosa*), Roche Chirazyme L-3 (purified lipase, carrier-fixed, carrier 2, lyophilizate, from *Candida rugosa*), Roche Chirazyme L-5 (lipase, solution, from

Candida antartica, type A), Roche Chirazyme L-5 (lipase, lyophilizate, from *Candida antartica, type A*), Roche Chirazyme L-5 (lipase, carrier-fixed, carrier 1, lyophilizate, from *Candida antartica, type A)*, Roche Chirazyme L-10 (lipase, lyophilizate, from *Alcaligines sp.*), Altus Biologics 8 (lipase from *Mucor meihei*) and Altus Biologics 27 (lipase from *Alcaligenes sp.*).

168. A process according to claim 162 where compound of formula **Z** is contacted with a compound selected from the group consisting of diazomethane, trimethylsilyldiazomethane, alkyl halide, alkyl triflate, alkyl sulfonate, alkylcarbonyl halide, alkylcarbonyl anhydride, arylcarbonyl halide, arylcarbonyl anhydride, alkyl isocyanate, aryl isocyanate, alkyloxycarbonyl halide, aryloxycarbonyl halide, alkylsulfonyl halide, arylsulfonyl halide, trialkylsilyl halide, dialkylarylsilyl halide, alkyldiarylsilyl halide, triarylsilyl halide, dialkyloxyphosphoryl halide and α,β-unsaturated carbonyl.

169. A process according to claim 162 where compound of formula **Z** is contacted with an alkylhydroxy in the presence of a trialkylphosphine or triarylphosphine and a dialkyl azodicarboxylate.

170. A process according to claim 162 where compound of formula **Z** is contacted with a compound selected from the group consisting of alkylcarboxy, substituted alkylcarboxy, arylcarboxy, substituted arylcarboxy, and amino acid and a compound selected from the group consisting of dicyclohexylcarbodiimide, diisopropyl carbodiiimide, 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide, N-hydroxybenzotriazole, N-hydroxysuccinimide, 4-nitrophenol, pentafluorophenol, 2-(1H-benzotriazole-1-yl)-1,1,3,3-tetramethyluronium tetrafluoroborate, O-benzotriazole-N,N,N'N'-tetramethyluronium hexafluorophosphate, benzotriazole-1-yl-oxy-tris-(dimethylamino)-phosphonium hexafluorophosphate, benzotriazole-1-yl-oxy-tris-pyrrolidinophosphonium hexafluorophosphate, bromo-trispyrrolidino-phosphonium hexafluorophosphate, 2-(5-norbornene-2,3-dicarboximido)-1,1,3,3-tetramethyluronium tetrafluoroborate, O-(N-succinimidyl)-1,1,3,3-tetramethyluronium tetrafluoroborate, and tetramethylfluoroformamidinium hexafluorophosphate.

171. A process according to claim 162 where the reaction is carried out in a solvent or in mixtures of solvents selected from the group consisting of acetonitrile, dichloromethane, dichloroethane, diethyl ether, dioxane, tetrahydrofuran, dimethyl formamide, dimethyl acetamide, N-methylpyrrolidine, dimethyl sulfoxide, benzene, toluene, dichlorobenzene, xylene, methanol, ethanol, isopropanol and water.

172. A process according to claim 162 where the reaction is carried out between 0°C and 100°C

173. A process according to claim 162 where the optically pure compound of formula **P** is isolated by the use of at least one method selected from the group consisting of chromatography, crystallization, re-crystallization and distillation.